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## EDITORIAL.

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### "ON THE CHOICE OF A PROFESSION."

Everybody with the coming of a new year is more or less prone to make resolutions, and while most of them are not kept, it is within the bounds of reason to imagine that a few are not altogether neglected. What these resolutions are, and in how far they will affect the individual's life for the better, is a matter to be decided by each of us, for it cannot be denied that the determination that suits one may be altogether ill-fitting for another. And it is well that this should be so, for what a cantankerous world this would be if we were to take upon ourselves the task of living up to the purposes of our friends! Dissatisfaction would hardly express our feelings; our nerves would soon become distraught, and enmity would shine from our eyes. Now let us admit at once how wrong all this would be, but how kindly disposed we are, nevertheless, to the resolutions of others, and especially how tolerant we are of what the young man hopes will carry him to the ramparts of success. For it is the young man who should interest us when a new year is ushered in; not the oldish man who makes resolutions which he knows he cannot keep: his past experience has taught him the futility of attempting to make an inelastic brain elastic enough to grow a new order of fixed purposes after the age of thirty. And the young man we have in mind is not the sprig whom Fortune has smiled upon, so that all he need be is a dilettante to satisfy his parents or friends, but the serious sort who must choose a profession so as to make a livelihood or—and this is a bitterness in after life—have it chosen for him by a well-meaning but misguided parent. Robert Louis Stevenson tells us a deal on this very interest-

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ing subject in a recently discovered essay, "On the Choice of a Profession," which Lloyd Osborne has brought to light in *Scribner's Magazine* for January.

Let us suppose that we are in the presence of a young man who resolves to embark on a medical career. Let us suppose also that our garrulity, our testiness, our disillusion are in abeyance and that we are amiable enough to lend a willing ear to his enthusiastic talk, and this without the slightest comment on our part. Although our attitude may have all the qualities of the sympathetic listener and although the young man's enthusiasm may be of the exalted sort that has the cocksureness that needs no support from others to bolster it up, it will not be long before he asks the pertinent question, "Well, don't you think I have all the qualifications of becoming a first-rate (he may even say eminent) doctor? Should we then drop our mask of amiability and tolerance, and speak the truth, or should we merely recognize at once how wrong it would be to destroy enthusiasm by any unkind word, when for all we know there may be the right sort of inclination or preference back of words that are almost hyperbolic in their exaggeration? Or would it be better to give the sort of advice that is evidently desired, and without any circumlocution make the statement that no other career would fit our interlocutor no neatly as a medical one?"

At this time when resolutions for the coming year are flying hither and thither to make of the next twelvemonth an example of high intents and things almost insuperable that shall be accomplished, a sombre view of past failures in medicine would be decidedly out of place. And yet, is it not a fact that among the resolves let loose at the present time there is a goodly number coming from young men who are quite sure that a medical career is the one for which Nature has fitted them? They may have seen only the glitter of the thing—the possibility of large fees, or they may have had a friend who with less mentality than themselves is already, after some five years in active practice, doing so well that no doubt can be cast on his fitness for the rôle of a medical man. Emulation is quite commendable; without it ambition would lose its best hand-maid; but even when emulation invites only the kindest criticism, it may be the result of a very superficial manner of thinking, a manner that takes small account of the stern realities of life. And the stern realities are closely bound with the practice of medicine, so closely that the glitter is often of a lustre that is easily dimmed.

In this preachment we would set forth, just as Stevenson does in his masterly essay, the wrong that we visit on the young man by



giving him advice. We would also wish to convey to the reader that, no matter how great his perspicacity, he should refrain from mapping out for another a future that may never be realized. No matter if the adviser's years have been blessed with the benefits of a successful medical career, no matter if he has arrived at the age when out of the fulness of his life he thinks he is justified in being a mentor to the young man about to take up the study of medicine, let him not be tempted into a rôle that no amount of easily-imagined forevisioning can justify. The failures in medicine come from the wrong sort of thinking on the part of the parent, but more often, we regret to say, from the family physician, who by his so-called kindly interest in the young man is responsible for the many failures which make up the darkest chapter in the history of medicine.

P. S.

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#### DO MEDICAL MEN LIVE LONGER THAN OTHER MEN?

How the thing started no one knows, but it is a fact that for more years than we would have time to count the impression has been abroad that the life of the medical man is a short one. A devoted wife may have bruited this interesting item in a physician's life, or perhaps it was an over-zealous mother, or a friend who took upon himself the rôle of kindly critic immersed in oceans of sympathy. Of course, we all know that in many communities there are quite a number of elderly medical men who are making strenuous efforts to be active, and often succeeding despite the watchful eye and rather belligerent attitude of the younger men, and who moreover give the lie daily to the belief that a physician's life is pitifully short. And although we know this, and although we have heard the complaints of the younger men to the effect that it is impossible for them to make a living with the insuperable obstacle of a number of old and tried and respected practitioners as a barrier between them and the desired rich patient, yet so firmly are we held in the thrall of believing that the days of the medical man are, as regards number, a negligible matter when compared with those of the merchant or banker, that were we asked of a sudden if a physician's life runs a long course or a short one we would not hesitate to declare the latter. And yet how wrong we are, how superficial a view is ours, if we are to believe what Dr. H. Drinkwater has recently written in the *Practitioner* (London) under the fascinating title of "The Longevity of Eminent Medical Men."

According to the English author—and he bases his assertion on the age at death of 2,113 men (and women) of note in medical

history—the average duration of life of a medical man is sixty-seven years and five months, whereas that of a non-medical man is fifty years. Thus can be seen at once the advantages of being a medical man and the fallacy of the belief that his life is much shorter than that of other men. But, it may be questioned, is the fact of a medical man's life being prolonged until his sixty-seventh year a real advantage? Is he capable of doing good work after sixty, and would it not be better for him to retire at fifty, if only to please the ambitious younger man of thirty, who sees in the elderly physician's presence and unremitting activity a menace to his own success? And even though it is true, as shown by Dr. Drinkwater in his paper, that a large number of medical men of eminence have lived beyond three-score and ten, it must be admitted that the majority did their outstanding work when less than fifty, in fact, between the ages of thirty and forty. This is a point that should not be overlooked when medical men preen their feathers on account of their enviable longevity.

In a book written by Barrie some years ago and entitled "Better Dead," this whimsical English novelist advanced the opinion that when a talented man reaches the apogee of his fame he ought to die, if only for the sake of his reputation. And knowing that most men would refuse to obey his mandate, Barrie conceived the idea of a Society for the Doing Away of Great Men, the members of which were kept quite busy dogging the footsteps of the great in London, and waylaying them in the most approved fashion. Many a medical man of eminence has really lived too long after a discovery—that is, has lived quietly and unostentatiously, for it is not given to most mortals to make more than one discovery in a lifetime. Now, can a reputation, no matter how well it has been deserved, withstand the attacks of the latest researcher, especially if the bearer of it outlives his one discovery, say, by thirty years and these years have been fruitless? But how different is the attitude of this same researcher in case the real discoverer is dead; with what reverence he approaches the matter of trying to prove that the incomparable one was slightly mistaken! Yes, indeed, it were better for his reputation if death would claim the eminent medical man shortly after a discovery has been made, that is if he would die in the scientific odor of sanctity which is given to few.

But it is an altogether different matter when we consider the ordinary medical man who jog-trots through life in a quiet, unostentatious way, and who shuns drink and drugs, reconciling himself to life's ironies and upsets by calling into play the sort of medical philosophy that is a bit tiresome to listen to but is an ex-



cellent ballast when a man is in the doldrums. This sort of practitioner has a right to live without let or hindrance, his reputation not being the sort whereby future generations will be dazzled. And even though the younger members of the profession are not any too tolerant of him, even though he clings to his practice despite a somewhat tottering frame and a mind none too active, the fact of his being well known and well liked on account of past successes should be enough to insure him a kindly consideration from all. How fortunate he is that his life has never had its even tenor broken by a discovery that means another milestone in the progress of medicine, he may not appreciate to its full extent; but the mere fact that even his bitterest opponents among the younger men could not possibly club together to form a society *a la* Barrie for the doing away of his life should convince him how great are his advantages over his less fortunate brother—the eminent medical man who has benefited mankind and must die young to save his reputation from falling into oblivion.

P. S.

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#### MURAL PAINTINGS AND HOSPITAL PATIENTS.

In a magazine story which we read some years ago the writer brought out the idea that wall paper can cause so complete an upset in a neurasthenic subject that insanity may result. The title of this story was "The Yellow Wall Paper," and though it had none of the insignia of a literary production its central idea was so commanding that we have never forgotten its vast import. Who has not been affected by the color and design of wall paper, especially when one has time to contemplate its atrocities in the early morning when sleep has forsaken us and our eyes fasten themselves on some object in the room in the hope of luring back the Fickle Soother, or, when sick-a-bed, a nurse, whose professional functions are of a high order, but whom Nature never intended as reader to the sick, for voice and intonation are execrable, really compels us as a relief to seek comfort by gazing at the wall? No doubt some reader, who makes a fetish of his own normality and is not above ridiculing what he supposes the abnormality of his friends, is already smiling on account of our silly point of view, and asserting his adamant qualities in the presence of the most disagreeable surroundings. But if what he asseverates is true, then many students of the effect of wall paper or bare white walls on convalescents are in a state of hyperesthesia, and should not be allowed to continue their investigations unhampered; in fact, should be stopped at once lest through their endeavors many

foolish ideas will be wrongly put into otherwise normal minds. Fortunately we have before us a document that fully agrees with our point of view, and which is not the idle thought of a very idle moment, but a deeply and carefully thought-out plan to sooth the nerves of the sick and bring into their sick-a-bed days a very important factor that it is hoped will make the period of convalescence a joy to the patient. Reference is here made to the mural paintings in the wards and private rooms of the Indianapolis City Hospital, the Burdsal Units of which were recently opened and which will be followed by the erection of five others, all to be decorated in conformity with a scheme that has for its object the mental uplift of all patients, be they young or old, by surrounding them with the gentle side of the painter's art—its softnesses, its lights and shadows in subdued tones, its soothing effects.

Which of us has not walked through a hospital, even through one proclaimed aloud as a modern one chuck full of all modern inventions, especially of the hygienic order, with no thought directed to the bare white walls, our minds being engrossed with the latest device to make life easier for the nurse, for the operating physician, and harder for the existence of germs! But although inventions of the sort we have in mind are grateful to that most exacting of all taskmistresses—hygiene, is not our concentration on them a declaration of our obtuseness to the mental needs of the patients? And which of us has not been sympathetically moved by the sight of the occupants in the children's ward, harnessed to their beds, and has not cast pitying glances on the wretched little sufferers and given a sigh of relief when rid of the harrowing spectacle? Of course, in going through this special ward we noted the cleanliness, the order, and all the latest devices so highly cherished by the scientific (?) doctor, but did we think for a moment that the hideous walls were an affront to our intelligence and a blight on the minds of the occupants? No indeed; what appealed to us was the polish all over the place, the high finish of which could not have moved Dickens' creations, Mr. and Mrs. Veneering, or the wife of Thomas Waring in Morley Roberts' striking novel "Time and Thomas Waring"—high priest and priestesses of the art of polish—to higher flights of enthusiasm.

Perhaps the wise administrators of the Indianapolis City Hospital noted not once but many times how indifferent physicians were to white walls, but how gloriously intoxicated they invariably got on new devices. And being wise they may have thought how strange it was that never did the bareness of the walls elicit any criticism, whether favorable or unfavorable, though on other mat-



ters enthusiasm knew no bounds. But whether it was this or some other reason, the fact remains that the walls of the two units which have just been completed are covered with mural paintings fashioned by the hands of such artists as William E. Scott, Wayman Adams, Carl Graf, Otto Stark, William Forsyth and others of like reputation; and to-day we have in this country one of the best illustrations of progress in hospital construction. When we said "one of the best illustrations" we really meant "the best," for can it be gainsaid by anyone that alleviation of mental distress by means of a happy blending of what the eyes see with what the mind craves is not of the greatest importance? Ask any patient, who has lain on his back for weeks, what comfort he gathered from studying white walls and ceilings. If the look in his eyes is not of the murderous sort, we are very poor students of human nature.

P. S.

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### DRINK.

It is rare that essays on drink in lay journals appeal to medical men, but the following lines from the *New Statesman* (London) have a cleverness that makes up for much that may be lacking of a scientific nature. The subject of drink has been exploited by many medical men in many medical journals, and while some of the writers have been moderate in their views and uninteresting, the majority have been too explosive and ridiculous. Perhaps a sense of humor, which is so necessary when writing on the subject of drink, has been lacking; perhaps the intense ardor of the reformer was too apparent. Be it the one or the other, one loses interest in most medical essays before the end; and it is in the hope that medical readers will renew their interest in this vital subject that the following lines are submitted for their scrutiny and further instruction:

Everybody at present is either drinking or talking about drinking. First, we had the drunken soldier; then we had the drunken soldier's drunken wife; now we have the drunken soldier's drunken wife's drunken friends. That is the picture of contemporary England that forms itself in the mind after one has been reading too many papers. If all trace of modern England were lost except files of the papers, the historian, on examining the evidence a thousand years hence, would be forced to the conclusion that in the year 1914 the population of the country was largely composed of spies and drunken women. Exaggerated though much of the talk may be, however, and offensive as are the proposals that are in the air for prying into the habits of soldiers' wives, the movement against drinking is of interest as revealing an immense change in the attitude of mind, not only of the Puritans, but of the general public. Perhaps it is science more than morals or religion that has brought the change about. When a man was told that if he sang "Yo-ho-ho and a bottle of rum!" and lived in the spirit of the song, he would

go to Hell, nobody cared much at the time except his mother. When it was shown by men of science that too much rum had such-and-such an effect on the blood and the brain, and would make him a worse soldier or engineer or journalist, generals and employers began to take an interest in the matter and the days of the heavy drinker were numbered.

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Drinking used to be regarded as the measure of manhood. If you could drink four bottles, you were looked up to with envy by the man who could only drink two. If you could drink two, the man who could only drink one talked to his friends about you with reverence. There are companies—especially among those who have not been drinking long—where this test of manhood still survives. But they are becoming rarer every day, and Socrates would not now add to his reputation for wisdom by being able to sit upright after all his companions had fallen under the table. The truth is, in the matter of drinking, the world of work has won the day. Drinking in the old style was possible only in a world of leisure. As one after another we are swept into the clutches of the professions and trades, there is no room left for the drinker; he is merely an interesting survival. Sobriety has now a cash value: it is more in demand than the latest patent medicine. There was very nearly an industrial civil war a year or two ago over the question whether an engine-driver has the right to get drunk even when off duty. The question was unfortunately left unsettled owing to the discovery that the particular engine-driver in regard to whom the trouble had arisen had all the time been sober. Even so, however, each of us knows in his heart that the right to get drunk is to all intents and purposes dead. We are so largely a population in charge of dangerous machines that our neighbors will not allow us to risk their necks for the sake of an extra glass of whisky. The rich man, it is true, can still depend on the brotherly sympathy of some magistrates when he is accused of driving his motor at fantastic speeds or in fantastic curves under the influence of liquor. But for the poor man in the same condition the rights of man, as interpreted by enthusiasts, have ceased to exist.

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At the same time, the mood in which we approach the question of drinking must be a mood, not of sentimentalism, but of realism. And in this mood any of us can see that, whatever may be said on behalf of drinking, there is nothing to be said on behalf of the temples of drinking. The modern public-house reveals to us every ugliness that a Zola, a Gorky, or a Gissing could have imagined. It is a sty, a kennel, a slum; and, if drink were not sold in it, no human being could voluntarily remain five minutes in it. It is, of course, a bright slum compared to the funereal slums in which we allow millions of our fellow-beings to live and eat and bring children into the world; but the one kind of slum increases the hideousness of the other. Whether it is possible in better circumstances to have drinking without drunkenness is a doubtful matter. But what is certain is that with a sunnier and more varied life for all human beings, drunkenness would become one of the rare vices. Drink is the parasite of misery, of filth, of ignorance. It is the cheapest entrance to comradeship, and the way to counter its dangers is to build a new world, in the fair and fine things of which every man and woman will companionably share.



## ORIGINAL ARTICLES.

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### THE NEWER BLOOD-VESSEL OPERATIONS—WHO SHOULD DO THEM.

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By **BERTRAM M. BERNHEIM, M. D.**, of Baltimore,  
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Some three or four years ago I attempted to stop a rapidly spreading gangrene of the foot by doing an arteriovenous anastomosis of the femoral vessels in Scarpa's triangle. The suture was successful, but the progress of the gangrene was unimpeded; therefore the leg was amputated at the thigh three days after the anastomosis, whose patency was established at the operation. This case taught the utter futility of attempting to restore tissue already doomed—a little careful thought might have revealed the same thing, but we were dealing with a new procedure whose possibilities were at that time unknown. Needless to say the experience has not been repeated and the lesson gained has been conveyed to others through my reports.<sup>1</sup> The interesting sequel to this story is that the subject of the above-mentioned case, N. R., aged forty-four, Russian, came into the hospital about sixteen months later with his remaining foot in so desperate a condition that amputation was almost the only thing to be considered. A sufferer from Raynaud's disease for years, and, having lost one leg, this man had gone from one hospital to another until there was left but the great toe of the remaining foot. The circulation of this was most precarious, as was that of the entire foot; there were several ulcers and a cyanotic tinge to the skin that boded evil. A more unpromising candidate for reversal of the circulation could hardly be imagined, and, had it not been for the fact that but one leg remained, I should have refused even to consider the operation. It was either this or nothing, so it was done. For two or three weeks all went well, so well, in fact, that the patient was informed that he would soon be about, could get an artificial leg for his right stump, and might again become a useful citizen, able to support himself, wife and family. This cheering news apparently had a most deleterious effect, for from that moment on he began to complain most bitterly of pain in his foot, and, despite all our efforts to prevent him, continually gripped his ankle in both hands, an effectual method of strangling

a circulation none too good at best. He plainly stated that he wished to be sent to the City Alms House. His wish was gratified, for the foot went from bad to worse and had to be removed.

At the site of anastomosis a thrill could be felt and traced down into Hunter's canal; a to-and-fro murmur was to be heard over the same area. A most unusual opportunity thus presented itself to determine whether or not the arterial blood was actually traversing venous channels and working its way down to the periphery, a point disputed ever since this operation came into being. It had always been my contention and that of others who had had experimental experience that if complete reversal of the circulation was possible in the animal—and everyone grants that now, I believe—it would be equally possible in the human, provided the suture was just as successful as in the animal. My clinical cases seemed to prove this, but the opportunity of demonstrating it by actual dissection in a given case had not hitherto presented itself.

Wishing to secure an absolutely unbiased opinion, I decided not to do the amputation myself, and not to have any of my close friends do it, but to send the man to the City Hospital, out at Bay-view (Baltimore Alms House), and allow the surgeon in charge to do it, merely requesting a written and signed statement as to the condition of the circulation distal to the site of anastomosis. The amputation was performed three and a half months after the reversal, by Dr. A. M. Shipley, of the University of Maryland, a general surgeon who had never done an arteriovenous anastomosis, and who, to my knowledge, had never seen one. He was good enough to invite me to be present at the operation, and I take this opportunity of thanking him for his courtesy and for his report, which is as follows:—

N. R., Russian, *æt.* forty-six. Amputation of the upper third of the left lower leg, without tourniquet.

A longitudinal incision was made over the anterior tibial vessels at the lower third of the leg, and the anterior tibial artery and vein exposed for examination. The artery was empty, the walls were quite thick but elastic when cut across. One accompanying vein was empty, but another *bled bright blood* in constant stream *from the proximal end*. Now the leg was amputated at the upper third, a collar flap being made. There was very little bleeding and this developed only a short while after the vessels were cut. The posterior tibial vessels were examined. *The artery was empty, but one accompanying vein bled in spurts from the proximal end, the blood being bright red in color.* Vessels were ligated with catgut, etc. Patient made an uneventful recovery.

In view of the fact that both the anterior and posterior tibial arteries were empty and did not bleed, and that accompanying each artery there was a vein that bled bright red blood from the proximal end, I feel that here is one instance at least in which it has been proved beyond question that not only was the anastomosis



successful, but that the vein valves were forced to such an extent that arterial blood passed down at least as far as the mid-lower leg *through the veins*—in other words, the circulation *was* reversed. It matters little that only one carrying vein accompanied each artery, or that only one bled in spurts, because the venous tree is differently constituted from the arterial and the stream is much more distributed. As a matter of fact, I was extremely surprised at finding even one spurting, pulsating vein. It had been my impression that since the vein wall contains far less muscle and elastic material than the arterial wall, pulsation could not be expected, except perhaps just below the site of union, where a transmitted pulsation might be obtained. A steady stream seemed more likely, but apparently both may be encountered.

So much for the circulation. As regards the danger of this operation, I can only say that in my series of 10 cases there have been no deaths. But perhaps the slight degree of inconvenience and danger may be best illustrated by the brief recital of a rather recent case. P. L., German-American, *aet.* sixty-three, patient of Dr. Joseph A. Seligman, began to suffer with pain, numbness and tingling of his left foot early in January last. His symptoms progressed and he was referred to me. A man older than his years, he had suffered a partial stroke of paralysis one year previously, had marked general arteriosclerosis, and his heart was in such a state of myocardial degeneration that he was unable to walk more than two or three blocks without evident distress. There was a fair femoral pulse in the leg, none in the popliteal, none in the dorsalis pedis arteries; and the foot had a cadaverous feel and appearance. The case seemed fairly favorable for reversal, but the patient's physical condition was such as to render operative interference of any sort hazardous. With rest in bed and skilful handling by his physician, he improved to such an extent that the operation was performed, a mixture of chloroform and ether being administered by Dr. S. Griffith Davis. The vein was found to be in good shape, but the artery, while patent, was so sclerotic and thick-walled as to render the lateral suture extremely difficult and the outcome doubtful.<sup>2</sup> It was a source of much gratification, therefore, when the patient reacted nicely to the operation and entered upon an uninterrupted convalescence. The enforced rest in bed did wonders for his general condition, and his leg and foot took on renewed vigor, the circulation being restored to such a degree that the cadaveric feel and appearance gave way to a temperature and color very nearly approaching normal.

I feel that the proper attitude has not always been taken with regard to the newer blood-vessel procedures, that there has been a tendency to jump to conclusions without adequate proof, whereas logical deduction from known facts would be more valuable. For

instance, I have a considerable amount of faith in the efficacy of a reversed circulation in preventing certain forms of gangrene, but realize that a more prolonged study of many cases—after a successful operation on them has been accomplished—must be obtained before definite opinion can be formed as to ultimate expectations in a given case. I intend to make such a study; in fact, it has been in course for some time. But no case that I have had offers so many interesting sides for observation and study as the one just related. I believe that even the most unbiased will admit that an operative success has been achieved. The question arises then, Will the blood continue to flow down the veins or will it not? And if not, why not? Personally, I do not believe it will, and for the following reasons: No operation, no known medication can stay the progress of an already well-developed arteriosclerotic process. It hardly seems possible for a femoral artery, so sclerotic, so thick-walled, so far gone in the process of obliteration, not to continue on its course until eventually the amount of blood brought to the present stoma and sent down the veins becomes insufficient to support the life of the lower leg. A further report may therefore be expected.\*

I have tried to state my position with regard to this operation with great care, because the general surgeon hitherto has had small faith in the practical applicability of the newer vascular surgery, has often not taken the pains to understand its technique, although he used the procedures, and has frequently laid the failures, which were really due to bungling, at the door of what he termed an impracticable operation. He calls to mind the carpenter who attributes his inefficient work to poor tools, and he fills the literature with ill-proved records of his doubt. A typical example is that of the surgeon<sup>3</sup> who, in reporting a case of arteriovenous anastomosis for threatened gangrene of the leg, says, "Through the newspapers the patient had heard of reversal of the circulation in cases like his own, and insisted upon having this done before consenting to amputation. Although faith was lacking in the procedure, it was decided to try it, on the principle that if the chance of success was small, the danger of doing harm was equally so. . . . For lack of finer material, a No. 12 needle and No. 16 silk thread were employed. These were soaked in liquid vaseline. . . ."

To those familiar with blood-vessel work, it comes rather as a shock to have a man say that for want of finer material he used a No. 16 thread in a case that certainly was not one of emergency. After all the emphasis that has been laid upon the absolute neces-

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\*There was an unavoidable delay in the publication of this article, hence, it is possible to report on this case now. In September the circulation of the leg gradually diminished, pulsation at the site of anastomosis became weaker and weaker, and the toes one by one became gangrenous. This condition progressed and the leg was amputated toward the end of the month—eight months after the arteriovenous anastomosis.



sity of using the finest thread procurable (at least a No. 000 and preferably a No. 00000),\* this is most discouraging. To my mind the use of extremely delicate suture material is equally as essential to a successful blood-vessel suture as is sterile gauze to a successful abdominal operation. And I am sure no man would have the audacity to say that for want of sterile gauze he made use of some nice, clean, old linen that he had on hand. Yet the two cases are not dissimilar.

For a time the aforementioned operation was apparently successful and the circulation in the leg was restored. In course of time this gradually failed, a line of demarcation appeared, and eight and a half weeks after the anastomosis an amputation was done. But before amputating, the anastomotic site was explored and a thrombus found, pathological examination of which revealed "an inner core consisting of red cells and leucocytes surrounded by a broad zone of young fibroblasts embedded in a structureless stroma, showing that the clot had been formed several weeks before removal."

To any unbiased observer it must be apparent that the improvement in this case followed an anastomosis that was temporarily successful. As the thrombus, inevitable in its occurrence from an admitted error in a well-defined technique, arose, the circulation was at first impeded; when the clot finally reached a size sufficient to block the anastomotic opening, the new circulation was entirely cut off, gangrene ensued and the leg had to be removed. But in spite of this perfectly obvious train of facts, the surgeon in this case, in speaking of the 50 or 60 other cases\*\* that have been done, says, "The great majority of these cases have terminated unfavorably, in that the circulation of the affected part underwent no immediate improvement, or the improvement was temporary. This lack of success has been attributed to a variety of causes—to an improper selection of cases, to defective technique, to immediate or secondary thrombosis, to lack of post-operative care, etc.—but most surgeons prefer to believe that it is due to inherent deficiencies in the operation itself. . . ."

This amusing conclusion and the uninformed rather than unfriendly criticism of many clinicians have led me to write this brief article in defense of a procedure which, inherited by the clinician from the laboratory, where brilliant experiments had given abundant proof of its possibility, has failed of general application simply because a little more skill of a special nature is required for its successful employment than for the routine operations. And the most curious feature of all is that men, whose judgment and fair-mindedness in other surgical work is unquestioned, take particular

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\*Blood-vessel sutures of the proper size, needle and thread, are now prepared by Johnson and Johnson. They come in tubes, all ready for use, just like catgut or any other suture material.

\*\*Now well over 100.

pains to condemn without going to the trouble to discover if by any chance their arguments may be false.

I have followed the literature of vascular surgery<sup>4</sup> in general for a number of years, but have been especially interested in reversal of the circulation as a preventive of threatened gangrene. The failures do far outnumber the successes—my own cases not considered—and it is from this that the general surgeon takes his cue, never stopping to analyze the facts. The report of nearly every failure is exactly the same, and may be divided for practical purposes as follows: (1) The author is a general surgeon who has had but little training in blood-vessel suturing; (2) it is his first or second case; (3) extremity partially gangrenous or threatened with gangrene—not infrequently the presence of one or more ulcers is noted; (4) physical condition of the patient in numbers of cases leaves much to be desired; (5) arteriovenous anastomosis; (6) temporary improvement in circulation, most striking in character—and unexpected; (7) gradual relapse of circulation—not unexpected; (8) complete relapse with line of demarcation or spread of gangrene; (9) amputation with exploration of the anastomotic site; (10) thrombus found occluding opening; (11) conclusion that the operation is not feasible; (12) warning against its use. *Apparently it never occurs to the writer that although the thrombus was the cause of failure, this same thrombus was the direct result of his inefficient and unskilled work.*

My argument is that if the anastomosis is successful, if blood passes from artery to vein and continues to do so, gangrene will not ensue provided the extremity is not too far gone in the process of degeneration to be restored and nothing is done to obstruct the flow below the site of the suture. And that blood can so flow permanently—in the human as well as the animal—has been proved beyond question by that case of mine in which I reversed the circulation in all four extremities of the same woman,<sup>5</sup> who has been examined by the surgical staff of the Johns Hopkins Hospital, that of St. Agnes Hospital, by members of the Interurban Orthopedic Club, before whom she was shown two years ago, and by numbers of other surgeons and physicians. It is unscientific to claim, without proof, that thrombus formation in these cases follows stagnation of the blood-current consequent upon an inability of the arterial pressure to break down the vein valves opposed to its passage. No one man or set of men possess powers so superhuman as to compel blood to flow through impossible channels. If it is possible for one, it is possible for the other, provided he possesses equal skill.<sup>6</sup> And to assert that the valves of this individual's veins or that individual's veins were not competent or were not as strong as those of the usual person, means nothing, since we know but little of the competency or strength of the valves of the deeper veins of one human as compared to those of another. This operation is never done with the superficial veins like the saphenous—where



varicosities or incompetencies might be expected. The deep veins that accompany the arteries are always utilized, and I have yet to encounter the case where the valves were not competent and where they did not at first offer the most strenuous opposition to the inroads of the arterial current.

It is likewise very unfair to claim that the few beneficial results that have been obtained are questionable and not conclusive in that they are probably the result of ligation of the femoral (brachial, if the arm) vein and consequent slowing of the return flow from the extremity—the so-called von Oppel's operation. If that were the case, why does a beneficial result not occur in every case—especially in those in which a thrombus forms? Can a vessel be more thoroughly occluded than by a thrombus, a plug?

There can be little question, I believe, that the maladies of the veins and arteries, surgical as well as medical, have been given thorough and devoted scientific study and that thereby a healthy respect for them has come to pass. For the relief of these maladies the physicians are untiring in their efforts, and their therapy, constantly changing as it is, is oftentimes most laborious and technical, requiring for its application men whose training has been specialized to an extreme degree. Their improving results are a monument to their devotion and patience in the face of almost insuperable obstacles.

What have we as surgeons done in an allied field? Our laboratory men have done noble work; their results compare favorably with those of their medical brethren. But outside the splendid work on aneurysms done by men like Halsted and Matas, the surgical maladies of blood-vessels are treated to-day about as they were twenty-five or fifty years ago. There is not a surgeon in the entire world who devotes his time exclusively to the study and relief of disorders of the arteries and veins. No clinic in this or any other country, so far as I am aware, has one member of its staff who is by training and interest especially fitted to do the surgical work of the vascular system intelligently, and to whom all of this work, of whatever nature, is referred. And vascular surgery is a field of work fascinating in the extreme, both experimentally and practically. The rewards of those who do eventually engage in it—for assuredly there will be in the near future the vascular surgeon just as there is now the neurological surgeon—will be great.

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## DÆMMERSCHLAF (TWILIGHT SLEEP).\*

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Unto the woman the Lord God said, "I will greatly multiply thy pains and the suffering of thy conception; in pain thou shalt bring forth children."

We medical men can testify that His wish was fulfilled, and we have long looked forward to some orthodox form of treatment to alleviate the pains of the parturient woman. Thanks to the scientist who isolated the drug and to the medical men who have perfected the technique in its administration.

The attempt to alleviate the suffering of the mother during the period of childbirth dates back since time immemorial. The women of the twentieth century live under high nervous tension and their nervous system is in a hypersensitive state. They therefore cannot undergo the burden of prolonged labor without seeking relief. The cry for chloroform, ether, and instruments begins when the patient is but a short time in the first stage of labor.

Knowing that labor is a physiological process, we heretofore permitted our patients to go through their ordeal unaided unless some complication occurred. The so-called better class patient always had her labor terminated by low forceps and primary anesthesia at the end of the second stage.

Dæmmerschlaß (twilight sleep—Gauss) is a mental state of sub-consciousness, not full anesthesia, produced by the administration of morphine and scopolamine hypodermically. It is given in regular and definite doses, repeated at intervals depending on the memory of the patient. Under this anesthesia the patient responds to pain but does not retain it in her memory.

Scopolamine was isolated by Schmidt in 1890, and Schneiderlein was the first to use it in narcosis; it was followed up by Korff, and Blos. Steinbuchel was the first to employ its use in obstetrics, and in 1902 reported his observations in 20 cases.

The studies of Krœnig and Gauss, of Freiburg, in the use of scopolamine and morphine in obstetrics, have created a world-wide interest since 1906, when they first published the results in 500 cases. Numerous surgeons, both abroad and in this country, have followed up the work: Zweifel, Beruti and Newell. Stefens and Hocheisen

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\*Read at a meeting of the Westchester County Medical Society, November 17th, 1914.



condemned this procedure after a trial in 300 cases, and offered the following objections: prolonged labor, asphyxia of the infants, and post-partum hemorrhage, which occurred in a number of their cases. Gauss attributed their failures to improper technique and faulty preparation of their drugs. In the spring of 1914, Gauss again called attention to its value and reported his successful observations in 3,000 cases.

Knowing the excellent reputation Krönig and Gauss enjoy, and having implicit confidence in the scientific work of a reputable German Clinic, the medical staff of the Jewish Maternity Hospital determined to give this method a fair trial. We had the good fortune to obtain the services of Dr. Kurt Schlossing, who is thoroughly familiar with the technique, having been an assistant in Krönig's Clinic for a number of years.

*Drugs Used.*—The drugs used to produce twilight sleep are scopolamine hydrobromic and one of the opium alkaloids—morphine-narcotine-meconate (narcophine), morphine muriate, and pantopon. Narcophine is a synthetic preparation made by Straub; it contains more narcotine than morphine. Each molecule of meconate contains one molecule of narcotine and one molecule of morphine. A 3 per cent. solution is used. One c.cm. equals 0.03 gm. of narcophine or one-half of a grain. The solution must be freshly prepared, and if it becomes cloudy it shows deterioration and should not be employed. If morphine muriate is used, 1 c.cm. of the solution should equal 0.01 gm. or  $\frac{1}{6}$  of a grain. If pantopon is employed, 1 c.cm. of the solution should equal  $\frac{1}{3}$  of a grain. Narcophine possesses  $\frac{1}{3}$  of the strength of the morphine alkaloid, and therefore has no depressing effect on the respiratory centre of the child (Straub). However, I have observed equally good results with both alkaloids. Morphine muriate can be used with absolute safety when narcophine cannot be obtained. I did not have sufficient experience with pantopon to make any comments.

Scopolamine is an alkaloid of the atropine series; it is also known as hyoscine. Some authorities consider them identical (Hatcher). Others believe they are derived from different plants and that scopolamine contains another alkaloid atropine, in varying quantities. It exists in three stereo-isometric forms: dextro, levo and racemic modifications. The levo has the strongest action on the peripheral nerve endings, and is most useful for this purpose.

The drug decomposes very quickly; therefore it has been very difficult to obtain a staple solution. Straub, of Freiburg, added the sexatomic alcohol mannite  $C_6H_8(OH)_6$  to the scopolamine, which prevents its deterioration. This is manufactured and prepared in 1 c.cm. ampoules by a German chemical firm. However, I think that any reliable chemist is capable of dispensing a staple preparation by the addition of a 10 per cent. mannite, so that 1 c.cm.

of the solution equals 0.0003 grm. of scopolamine or 1/200 of a grain.

#### TECHNIQUE.

In order to obtain the best possible results, we followed, very carefully, the technique of Krønig and Gauss. The entire labor must be under the constant supervision of a trained experienced nurse, and guided by a physician familiar with the technique.

We begin treatment when the patient is in active labor—having regular intermittent uterine contractions, at intervals of about five minutes, and duration from one-half to one minute. At this stage the cervix is sufficiently dilated to admit two to three fingers. The patient is removed to a room where there is the least possible noise, and placed in bed where she remains until after the delivery. We observe and record prior to each injection, the pulse-rate, blood-pressure, respiration, frequency and duration of uterine contractions, and fetal heart sounds.

The initial dose consists of scopolamine hydrobromic  $1\frac{1}{2}$  c.cm. of a 3/1000 per cent. solution equivalent to 0.00045 grm. or 1/133 of a grain, together with 1 c.cm. of a 3 per cent. solution of morphine-narcotine-meconate (narcophine). One hour later a second dose of scopolamine is administered— $\frac{1}{2}$  c.cm. or one-third of the initial dose, 0.00015 grm. or 1/400 grain. Half an hour later we apply the memory test. It takes from three-quarters to one and a half hours for patients to get under the influence. The patient is asked if she remembers the number of injections given, or when she was last examined, or you may call her attention as to when she had seen a certain object that was previously shown to her, say within half an hour. If her memory is clear, she is not under the influence, and a third dose of  $\frac{1}{2}$  c.cm. of scopolamine is injected (1/400 grain). If, however, the patient is in a mental state of amnesia, the injection is not given until one hour after the second dose. From now on the repetition of the injections are gauged by the degree of amnesia present, and the dose of scopolamine is never more than  $\frac{1}{2}$  c.cm. or 1/400 of a grain. The injections are repeated at intervals from one to one and a half hours. Narcophine or morphine is not repeated except in rare instances when the patient is very restless, and then we use  $\frac{1}{2}$  c.cm. of a 3 per cent. solution or 0.00015 grm. ( $\frac{1}{4}$  gr.).

After the child is delivered, the cord is quickly clamped and the infant is removed to the nearest room. The reason for this procedure is that the cry of the child may arouse the mother from the subconscious state and she may then reconstruct the entire event of her labor. She may then have what Gauss terms "Isle of Memory." For that same reason Krønig recommends the use of ethyl chloride for primary anesthesia as the head passes through the vulvæ, for the pain may be so excruciating as to arouse the mother.



Our aim is to individualize the treatment, and the results have been very satisfactory. In the spring of 1914 Siegel, of the Freiburg Clinic, devised a uniform scheme and treated 220 cases in a mechanical way. He did not employ the memory test as a guide and claimed good results. His technique is the following:—

Initial dose  $1\frac{1}{2}$  c.cm. scopolamine ( $1/133$  gr.) and  $\frac{1}{2}$  gr. narcophine.

Three-quarters of an hour later  $1\frac{1}{2}$  c.cm. scopolamine ( $1/133$  gr.).

One and a half hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.) and narcophine  $\frac{1}{4}$  gr.

Three hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.).

Four and a half hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.).

Six hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.) and narcophine  $\frac{1}{4}$  gr.

Seven and a half hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.).

Nine hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.).

Ten and a half hours later  $\frac{1}{2}$  c.cm. scopolamine ( $1/400$  gr.) and narcophine  $\frac{1}{4}$  gr.

We tried this method in a few cases and we gave it up, as those children were born in a state of oligopnea, and we attribute it to the repeated doses of narcophine.

*Effect on the Mother.*—The action of the drug is chiefly on the central nervous system. It produces a mental state of subconsciousness with a forgetfulness of the pain which occurred while under the influence. The patients retain the power of perception but not of apercception. The progress of labor is not interrupted, and the uterine contractions continue as in normal labor. After the first injection the pain becomes less intense and the patient experiences it only at the acme of the uterine contraction. This may be ascertained by placing the hand on the abdomen during the pain. It therefore appears to the spectator that the pains are of shorter duration.

*First Stage.*—In our series of over 200 cases the first stage of labor was usually shortened. This is probably due to the fact that a great majority of our patients, especially the multiparæ, are admitted to the hospital somewhat in advanced labor. However, in some primiparæ I observed a rapid dilatation of the cervix after the administration of the first dose. This may be attributed to the softening effect of morphine on the cervix. Siegel, of Freiburg, in his series, reported a delay of one hour and twenty-two minutes in the first stage. Most all of our cases presented these constant symptoms: flushing of the face, dilatation of the pupils, and dryness of the mouth. Small amounts of water are permitted.

*Second Stage.*—We observed that the second stage of labor is somewhat prolonged, especially the perineal stage. Siegel, in his series, observed a prolongation of only thirty-three minutes. We

think that in primiparæ it is sometimes an advantage, as it permits a slow dilatation of the pelvic floor, and thus prevents lacerations. However, in some cases the expulsive power of the mother is greatly retarded, due to the fact that she is in a subconscious state, and cannot always be instructed to bear down. In these cases pituitary extract is a great adjuvant. The administration of  $\frac{1}{2}$  to 1 c.cm. of a standard preparation sometimes renders quick results. Personally, I have great respect for the use of pituitary extract in obstetrics, but realize its dangerous effect on the child. When it is combined with scopolamine it has to my mind a more marked depressing effect upon the respiratory centre of the child. I prefer resorting to the application of low forceps rather than the use of pituitrin; this can be accomplished even without the aid of a general anesthetic, and the patient will not recall the event if she is under the influence. However, there is no harm if one wishes to administer a few drops of chloroform, ethyl chloride, or ether for the purpose of relaxation as well as to prevent the patient from regaining consciousness.

*Third Stage.*—The third stage in our series was not affected. One of the objections to the treatment, by those who oppose it, is post-partum hemorrhage (Hocheisen). We did not observe any excessive bleeding that can be attributed to scopolamine; this would perhaps prove a tendency to lessen the hemorrhage. Harrar and McPherson, in their series of 100 cases, report two instances of severe post-partum hemorrhage, controlled without packing. They attribute it to the atony of the uterus from the wearing off of the effect of the pituitrin.

*Post-Partum Period.*—After the labor is terminated, the mother drops into a restful sleep which lasts from two to three hours. She awakens and finds herself rested and in a cheerful mood. The appearance one would expect to encounter after a prolonged labor is conspicuous by its absence. There are no signs of shock or exhaustion. Frequently, the patient, placing her hand on the abdomen and feeling the contents gone, will inquire of the nurse if she has already had the baby and if it is alive, for she did not hear it cry.

At Freiburg, within twenty-four hours after the birth, they institute passive exercises of the upper and lower extremities, abdomen, back and perineum. These consist of flexion and extension of the extremities, placing the hands behind the head and raising the patient to a sitting posture in bed, and then allowing her to recline again; then abducting and adducting the thighs, bringing the knees together against the patient's resistance. On the second day the patient sits up in bed; on the third day sits in an armchair; on the fourth day is permitted to walk. These exercises are per-



formed morning and evening. The contraindications are fever and laceration of the perineum.

In our series we did not follow out these exercises, for the patients in this country do not take kindly to them. However, we permitted some of them out of bed at the end of the third day, and on the fifth they walked about the wards making themselves generally useful.

I had the opportunity to examine post-partum and follow up a number of cases that performed the prescribed exercises, in the service of Dr. W. H. W. Knipe at the Gouverneur Hospital, and I am happy to report, with great surprise, the uterus well involuted, in normal position, and the general wellbeing of the patient.

I will take the liberty to cite the following case as it was the longest case in our series.

CASE I.—No. 138, Mrs. R., *æt.* twenty-one, primipara, admitted to the hospital September 10th, 1914, at 6 p. m. Pelvic measurements, normal. Position, left occipito-anterior. Vertex presenting, not engaged; cervix dilated, admitting one finger, and thick. She had pains every ten to fifteen minutes lasting for about fifteen seconds. About 10 p. m. the uterine contractions became a little stronger at intervals of about eight minutes.

First injection at 12:30 a. m., scopolamine  $1\frac{1}{2}$  c.cm. or 1/133 gr. and narcophine 1 c.cm. of 3 per cent. solution  $\frac{1}{2}$  gr.

Examination: Cervix, five fingers dilated, membranes intact, head not engaged, cervix thick, uterine contractions every five minutes, duration one and a half minutes, pulse 80, respiration 24, fetal heart 140, blood pressure 120.

Second injection, 1:25 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Third injection, 3:00 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr. Patient in state of amnesia.

Fourth injection, 4:30 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Fifth injection, 6:30 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Sixth injection, 7:30 a. m., scopolamine, narcophine  $\frac{1}{4}$  gr. Patient restless.

Seventh injection, 8:00 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Eighth injection, 9:30 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Ninth injection, 11:30 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Tenth injection, 1:20 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Eleventh injection, 3:10 p. m. (1 c.cm. pituitrin), cervix fully dilated, membranes ruptured, pains weak.

Twelfth injection, 3:20 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Thirteenth injection, 4:20 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Fourteenth injection, 5:20 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Fifteenth injection, 6:30 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Sixteenth injection, 8:05 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Seventeenth injection, 9:05 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Eighteenth injection, 10:30 p. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

Nineteenth injection, 11:30 p. m., 1 c.cm. pituitrin, head on the perineum, uterine contractions not very strong.

Twentieth injection, 12:30 a. m., scopolamine  $\frac{1}{2}$  c.cm. or 1/400 gr.

At this stage the pituitrin had little effect, so I resorted to low forceps under slight anesthesia and extracted the child, which weighed 11 lb. 12 oz., at 2 a. m. The baby cried at once.

Result: Amnesia with analgesia.

*Summary.*—Number of scopolamine injections, seventeen, equivalent to about  $1/20$  of a grain in twenty-eight hours. Patient coming out of twilight about 5 a. m.

Number of pituitrin injections, two.

Narcophine repeated only once for restlessness.

The nurse informed me that the patient slept until 5:00 a. m. I called about 10:00 a. m. and found her rested, cheerful and showing no signs of exhaustion. On questioning her she told me that the day was Friday, when it actually was Saturday; and she thought that she gave birth after the first injection. The only pain she experienced was from the beginning of labor until the second injection, and she did not recall any event during the entire procedure. The puerperium was normal.

#### THE EFFECT ON THE CHILD.

The greatest objection advanced by those opposing twilight sleep, is the occurrence of asphyxiated children. Our experience tends to show that with proper technique and the careful observation of the fetal heart, especially at the end of the second stage, we can almost eliminate this objection.

A certain percentage of scopolamine babies are born in a state of oligopnea; that is the child cries almost immediately after the delivery. The respirations are shallow and the heart rate slow. They respond almost immediately to slight flagellation. Gauss does not even attempt to resuscitate them and leaves the infants alone from fifteen to twenty minutes, when they react spontaneously, thus claiming that there is no danger. However, we see no advantage in his procedure, so we attempt to resuscitate them at once.

In our series of 202 children, 168 cried spontaneously (83.1 per cent.). There were 30 cases born with some degree of oligopnea (14.7 per cent.), and some of these did not even require resuscitation. The average delay for the vigorous cry of the infants was about five minutes. These were 4 cases of asphyxiated children (1.9 per cent.). The number of children that died within the first twenty-four hours was 5. There was one still-birth (macerated), from a case of hydramnion, making a total of 6 (2.9 per cent.).

The following were the causes: (1) Premature infant with spina bifida; (2) melena neonatorum; (3) subdural hemorrhage (this was the clinical diagnosis, as we could not obtain an autopsy); (4) edema of the glottis; (5) this child had transposition of the viscera, dextra cordis, with a congenital opening in the diaphragm through which the stomach, large intestines with the appendix, found their way into the upper left thoracic cavity.

From the above report there is not a single death that we can attribute to scopolamine. However, the infant mortality, even at



that, compares very favorably with the ordinary fetal mortality of 1.5 to 2 per cent.

#### CONTRAINDICATIONS.

The only contraindication against this method is primary inertia (Gauss). We do not employ it in any case where a hurried delivery is imperative, as in placenta previa. In our series we used it with successful results in 2 cases that were in the pre-eclamptic state. One patient developed a post-partum convulsion after she came out of the influence. In the opinion of the attending surgeon the anti-partum convulsions were prevented by this procedure. The second case was more profoundly toxic than the first, and she did not develop any convulsions. The attending surgeon shortened the end of the second stage by the application of forceps. Zweifel reports 3 cases of eclampsia successfully treated with this method. We do not employ it in cases that are far advanced in labor. It seems to me that compensated cardiac cases would be greatly benefited by it, as this procedure eliminates mental shock and actual physical strain. Siegel used it in some cases of contracted pelvis with conjugate vera—7.9 cm., 8.8 cm., 8.7 cm., and 8.5 cm.

#### RESULTS.

Complete amnesia was present in 83 per cent. of our cases. They did not recollect having any pain after the second or third injection, and their minds were in a state of oblivion. Analgesia occurred in 8.7 per cent., there was a diminution of pain without amnesia. In 8.3 per cent. the drug had no effect.

The results, therefore, show that over 91 per cent. of the patients were benefited by the treatment without untoward effects. We observed clinically that the higher the mental state of the patients the more easily were they influenced by the treatment; and the few unsuccessful cases occurred in those possessing a lower state of mentality.

The operative interferences in our series were four medium forceps, eighteen low forceps, and two breech extractions. The indications for those procedures, I have already mentioned. The number of perineal lacerations has been reduced. Siegel reports 7½ per cent. of lacerations as compared with 13½ per cent. in cases without twilight sleep.

#### CONCLUSIONS

1. Success means when the memory of the event of labor is lost (amnesia).
2. Success depends on the employment of the proper technique (Gauss), and the administration of standard solutions. No mechanical formula should be used and the treatment individualized.

3. Treatment must begin when the patient is in active labor.
  4. It should not be employed in short labors, as it takes from three-quarters to one and one-half hours for a patient to get under the influence.
  5. Perineal lacerations were diminished and there was less tendency to post-partum hemorrhage.
  6. If pituitrin is given at the end of the second stage, one must always be prepared to extract with forceps, especially if there is a drop in the fetal heart rate.
  7. The puerperium is unaffected and patients convalesce normally.
  8. The patient must be under constant supervision of a trained nurse, and the fetal heart frequently observed, especially at the end of the second stage.
  9. No unfavorable results were observed in those children that were born in a state of oligopnea; they were all discharged well.
  10. The daily systematic exercises and the early rising have a tendency to lessen uterine displacements, and greatly aid involution.
- Finally, from our observations and experience we conclude that this treatment has no untoward effect on the mother or child. It certainly deserves a continuation of its use. All medical men interested in obstetrics ought to give this a fair trial. We feel that we have a therapeutic measure at our command that can greatly alleviate the pains of the woman through her ordeal of labor, and save eight to ten hours of suffering.



## CROTALIN TREATMENT FOR EPILEPSY. THERAPEUTIC RESULTS AND METHOD OF ADMINISTRATION.

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Since crotalin was first used hypodermically (March, 1909), for the treatment of epilepsy,<sup>1</sup> numerous reports have come to the writer from physicians in this and other countries, and medical literature on the subject, although still quite limited, has recorded some very interesting and convincing observations.

Fackenheim,<sup>2, 3, 4</sup> of Germany, treated 100 cases of epilepsy with crotalin during a period of four years and, summarizing his experiences, says: "The effect of crotalin is surprisingly favorable. It acts decidedly better than any of the other methods used heretofore for the treatment of epilepsy, many of which produce other symptoms injurious to the human organism. I can assert that crotalin not only exercises a favorable influence upon the virulence and the number of epileptic fits, and upon the excitability of the nervous system, but also considerably improves the general health of the patient and his mental faculties. Crotalin not only acts upon the nervous system and its excitability, but also upon the quality of the blood and the patient's general metabolism." He concludes:—

"First, in cases of essential epilepsy, crotalin seems to have the most lasting results.

"Second, the phenomena of epilepsy lose their intensity and frequency in spite of the withdrawal of the bromides and other narcotics.

"Third, not only is the general health of the patient considerably benefited, as regards physical conditions, but psychical improvement is especially noted."

Boston<sup>5</sup> reports, "I have treated 11 cases of epilepsy with rattlesnake venom; 9 patients have shown relief. In girls about the age of puberty, it seems to have a decided effect, not only on the epileptic seizures, but on the patients' general temperament and development."

Woodruff<sup>6</sup> has treated a number of epileptic patients with crotalin and reports that the so-called idiopathic forms of the affliction are most amenable to its use. He says: "The crotalin treatment will modify the severity of the attacks and often change their character from grand mal to petit mal. The interval between the attacks will be lengthened and the mental activity of the patient will be greatly improved."

Mays<sup>7</sup> collected 64 cases of epilepsy which had been treated with crotalin for periods varying from two to seven months. "Included in this series were 25 institutional cases, who were treated for seven months without crotalin, and for the succeeding seven months 13 of the patients received the different bromide compounds, calcium lactate and crotalin, while the remaining 12 cases were treated with crotalin alone—a most impartially and scientifically conceived experiment.

"By dividing the first seven months in which no crotalin was given into two equal parts of three and a half months each, it was found that the total seizures at the first half period were 2108, and in the second half 2640, showing an increase of 20 per cent. in the seizures during the first seven months. The same analysis, applied to the seizures of the 25 patients, of whom a complete record is given during the last seven months, shows a total number in the first half period of 3,365, and in the second half period 3,265, or a diminution in the seizures of 10 per cent.

"On the other hand, the seizures of the 13 patients who received crotalin, the bromides, and calcium lactate, during the last seven months, show that 2,234 seizures took place in the first, and 2,252 in the second half, or an increase of 0.8 per cent. of seizures, while the 12 patients who received crotalin alone during this period had 1,431 seizures in the first and 998 in the second half period, showing a diminution of 30.39 per cent. in the seizures. This seems to indicate rather conclusively that the exclusive use of crotalin gives by far better results than when it is given with the bromides and the calcium lactate." He concludes:—

"1. As a rule, crotalin has the power of relieving the paroxysms of epilepsy if given in appropriate doses.

"2. The average maximum dose lies between gr. 1/100 and gr. 1/50, although the former must be preceded by minimum doses in probably every case.

"3. Crotalin has more power to relieve epilepsy than the bromide compounds."

Keatley<sup>8</sup> reports a series of 14 cases treated for the short period of four and a half months, and summarizes his conclusions thus: "The 14 cases averaged 97 attacks per month before using the venom and 87 per month was the average during the four and a half months it was being used. One of the patients was greatly benefited as to the number of seizures; in 3 cases the character of the seizures was changed from a severe to a light form, and in 11 of the cases there was no change in the character of the attacks."

Calmette, Director of the Pasteur Institute, and Mezie<sup>9</sup> read a paper at the French Academy of Science, March, 1914, on a "Trial of the Treatment of Essential Epilepsy by Crotalin." Their observations had extended from October, 1911, and included the



treatment of 11 cases. The patients were all females who ranged in age from twenty to sixty-five years. No special regime as to diet or exercise was followed. No other medicine was used.

The 11 cases had a total of 3,622 attacks the year before the crotalin was used, and during the first year they received the crotalin injections the number of attacks was reduced to 1,916, a difference of 47 per cent. The greatest improvement during the first year of treatment was manifest in a twenty-year-old patient, where the total number of attacks dropped from 648 the year before crotalin was given to 170 during the first year's treatment, a difference of 73.6 per cent. The least benefit during the first year's treatment was in a thirty-seven-year-old patient, who had 209 attacks the year before treatment and 216 attacks during the first year crotalin was used, an increase of 3.2 per cent., but during the second year's treatment the total number of attacks was reduced to 120, a decrease of 42 per cent.

Another encouraging observation was the fact that four of the cases, who had had a total of 1,106 attacks the year before using crotalin, had their total reduced to 908 during the first year crotalin was being used and a further reduction the following year, when no crotalin was given, to 574, showing a tendency of improvement after the injections were discontinued.

Finally, to control their results they took three epileptic patients and injected the same doses, and under similar conditions, after heating the venom to 100° for five minutes or more so as to clear it of its albumin and destroy the toxicity. This experiment was continued for four months, and the average number of attacks per month before administering the non-toxic venom was 42.9, and during the treatment the average per month was 38.7. From this regime with the control tests it would appear that the number of attacks was practically not modified, which goes to prove that it is the toxicity of the venom which does the work. They conclude as follows:—

"1. Crotalin has almost always a useful action in essential epilepsy.

"2. The efficacy varies according to the age of the patient and the condition of the malady. The younger and healthier patients appear to receive the most benefit.

"3. The attacks are arrested in their progression, and the tendency to grouping in series disappears.

"4. After cessation of the treatment, the number of attacks in some cases continued to diminish and in others the modified number remained stationary."

The writer has personally administered crotalin in more than 300 cases of epilepsy, covering a period of five years, and has re-

ceived reports by letter from 131 physicians who have administered crotalin solution hypodermically to epileptic patients.

In a previous article<sup>10</sup> the writer reviewed the chemistry of snake venom, pointing out that crotalin belongs to the albuminoids, and consists of two principal compounds; and that from the nature of its composition it exercises a double action upon the organism into which it is injected.<sup>11</sup> The peptone element contained in the venom has a paralyzing effect on the nerves when given in large doses, while in minute doses it has a quieting effect upon the nervous system. The other principal compound of the venom, the globulin poison, acts on the blood, in large doses completely destroying the power of the blood to clot, in smaller doses exerting a retarding action on the inherent tendency of the blood to coagulate.

It has been the writer's privilege to make a study of the clotting time of the blood in 235 cases of epilepsy during the past two years. For the purpose of determining the effect of crotalin solution injections on the clotting time of the blood, a Boggs coagulometer was used and the coagulating time noted in the patients, two or three days after each crotalin solution injection. A series of 18 cases<sup>12</sup> was thus studied weekly for a period of six months by the writer, and reported in detail with the following deductions:—

First, the symptoms of epilepsy are closely related to certain changes in the composition of the blood.

Second, it is possible to influence the composition of the blood through the hypodermic administration of crotalin solution.

Third, we possess in crotalin a therapeutic means which can influence advantageously the altered condition in the blood of epileptics.

In many cases of epilepsy the coagulating time of the blood is shorter than normal.<sup>13</sup> From the writer's clinical experience in the past two years, he is convinced that crotalin in minute doses has the power gradually to lengthen the clotting time of the blood, and that if a lengthened clotting time can be maintained, the usual epileptic manifestations are much modified.

#### METHOD OF ADMINISTRATION.

It is important that a solution of crotalin, which is to be administered hypodermically, be prepared with the utmost precaution. The solution which the writer uses and has found most satisfactory is prepared by the Chas. A. Wolf Pharmaceutical Laboratories, Philadelphia. These laboratories are thoroughly equipped for bacteriological work, and the writer has satisfied himself that every possible aseptic precaution is taken in the preparation of their crotalin solutions. Moreover, no solution is sold to physicians until a thorough bacteriological test has been made to prove its freedom from contamination with aerobic and anaerobic bacteria. The so-

lution is put up in sterilized ampoules containing 1 c.cm. each of varying concentrations, *i. e.*, 1 c.cm. represents 1/600 grain, 1/400 grain, 1/300 grain, etc., according to the strength desired by the physician.

*Technique of Giving Injection.*—It has seemed best to use an all glass, aseptic, hypodermic syringe and a platinoiridium needle, about 1½ in. in length. The needle is heated over a Bunsen flame or boiled. After breaking off the neck of the ampoule the crotalin solution is drawn into the syringe and, after expelling the air, is ready to be injected.

The site of injection is cleansed with tincture of green soap and alcohol, or touched with tincture of iodine. The needle should be well introduced into the muscles (intramuscular), at an angle of about 60°, and the contents of the syringe expelled slowly. After withdrawing the needle, the wound is covered with a little sterilized cotton and collodion, or Turlington's balsam.

*Site of Injection and Local Reaction.*—It has been the writer's practice to give the injections in the supinator group of muscles of the forearm, as a rule using the right and left arm alternately. The degree of local reaction obtained varies with the individual susceptibility of the patient. In most cases the patient complains of a slight burning or stinging sensation at the site of the injection, and this sensation frequently radiates for a few inches up and down the forearm. This discomfort lasts but a few minutes, and no further effect is noticed for from two to six hours, when a slight erythema and swelling appear. The degree of cellulitis thus produced varies greatly in different subjects, and a decided variance in susceptibility is often shown from time to time in the same individual. In the average patient the maximum amount of local reaction is obtained in from twenty-four to thirty-six hours after an injection, and by the third or fourth day, the part, in which the injection was given, will usually have regained its normal condition.

The forearm has been chosen as the site for the injection so as to avoid the involvement of the shoulder-joint, in case the patient shows undue susceptibility or an excessive cellulitis is produced. Moreover, it is very convenient to apply to the forearm an ice cap or a saturated solution of sulphate of magnesia, on layers of sterilized gauze, if the patient complains of much inconvenience from the reaction, so that it is necessary to use a local application.

*The Dose.*—In the average case the writer usually gives 1/400 grain of crotalin in solution at the first injection. In children, anemic adults, or plethoric subjects, he frequently uses only 1/600 grain for the initial dose.

The second treatment should not be given until all evidence of local reaction from the first injection has disappeared. As a rule it is best to wait at least seven, and in some instances, ten days be-



fore administering the second dose. The strength of dose at the second treatment should never be larger than at the first treatment. In nine out of ten patients the small dose produces but slight local and no systemic manifestations, but one out of ten or twelve patients occasionally will exhibit evidence of oversusceptibility. Thus, if the strength of the second dose is increased, and any anaphylactic tendency is present, a severe local and profound systemic reaction will result.

*Eosinophilia as a Guide to Dose and Frequency of Administration.*—Crotalin will produce an eosinophilia in a patient if a large enough dose is given. The strength of dose which causes an increase in the percentage of eosinophil cells varies with the susceptibility of the individual. The writer has seen a 29 per cent. eosinophilia result from a 1/300 grain dose. In another patient a 1/200 grain dose produced a 43 per cent. eosinophilia. On the other hand some patients can be given 1/75 grain or occasionally 1/50 grain, and the differential leucocyte count will be practically normal. As a rule, the greater the amount of local reaction which appears after the injection, the higher will be the percentage of eosinophils present. There are exceptions to this rule, however; and only recently the writer gave a patient 1/100 grain with practically no local reaction, and yet, in the differential leucocyte count two days later, the percentage of eosinophil cells was nineteen. It is unwise to depend upon the degree and character of the local reaction for the purpose of regulating the strength of dose and frequency of administration. The susceptibility of the patient to crotalin can be determined by the degree of eosinophilia produced.

*Importance of Differential Leucocyte Counts.*—It should be a routine practice when beginning the treatment of a patient with crotalin solution, to have a complete blood count made, and the percentage of hemaglobin estimated before the first injection is given. From thirty-six to seventy-two hours after the injection, when the local reaction has about reached its height, another differential count is made, noting especially the increase in the percentage of eosinophil cells. Clinical experience seems to indicate that it is best not to have more than an 8 to 10 per cent. increase in the eosinophils in most cases. As a rule, in from six to eight days after a treatment, the eosinophil cells will have dropped to 2 to 3 per cent. To be sure that the differential count has returned to near the normal, another differential count is made before giving the next treatment. It is advisable always to make the two differential counts between treatments, but it is imperative that a second be made if the eosinophilia has been above 12 per cent. at the height of the local reaction (seventy-two hours). In patients with oversusceptibility a subsequent treatment must *not* be given until the percentage of eosinophils has returned about to normal. Occa-

sionally, the writer has felt it advisable to wait as long as three weeks between treatments, in cases showing a marked eosinophilia from the crotalin solution injections. It is not wise to increase the strength of dose as long as an 8 to 10 per cent. eosinophilia is produced.

#### GENERAL CONCLUSIONS.

As a result of personal experience, from a review of the literature above referred to, and from correspondence with physicians who have reported on the use of crotalin in cases of epilepsy, the following conclusions may be drawn:—

First, crotalin in properly regulated doses modifies the severity of epileptic attacks and lengthens the interval between the seizures. There are cases on record in which the attacks have been entirely absent for periods of from one to five years.<sup>14</sup>

Second, crotalin improves the general health and metabolism of the patient. No hemolytic effect is produced on the blood.<sup>15</sup> In females, functional menstrual disturbances are often much relieved and regulated.

Third, the mentality of the patient is favorably influenced by the use of crotalin. Apprehension and fear of an impending seizure, so characteristic a condition of the epileptic, frequently entirely disappear. The patient regains confidence in his own ability, with the result that a regular occupation can often be followed.

Fourth, the best results are obtained if bromide or other sedative treatment is gradually withdrawn, and eventually entirely withheld.

Fifth, it is preferable for an epileptic to have an occasional convulsive seizure, and to possess a clear mind and healthy body, rather than to have the patient's general health undermined and his mentality dulled by the use of bromide and other sedatives.

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## CONGENITAL DISLOCATIONS OF THE HIP.

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Of the congenital dislocations, that of the hip is the only one that is not very rare and the only one that has received any great amount of attention from orthopedic surgeons. The condition is found described in medical literature from the earliest times, but a careful study of the subject dates from Schreger's work, in 1818, followed by Dupuytren's study of the anatomy of the deformity in 1825. This surgeon brought the subject before the Académie des Sciences, in 1826, and called attention to the fact that the affection was often inherited and often bilateral. Since that time a vast amount of work has been done on the condition, the treatment receiving special attention; but of the various methods employed successful results have only been obtained in the last few years.

## ETIOLOGY.

This branch of the subject has been extensively studied and a great number of hypotheses advanced to account for the condition, which cannot be discussed here. But there are three hypotheses which deserve special consideration: (1) That the deformity is caused by traumatism resulting from injury inflicted during birth or soon after; (2) the condition is due to spasmodic muscular action during fetal life and is analogous to club-foot; and (3) that it is due to malformation of the acetabulum or the femur or both. As Hoffa's statistics, collected in 1889, and many with similar findings since, show that about 87 per cent. of cases occur in females, while only 13 per cent. occur in males, it does not seem that either of the first two reasons given above could account for the deformity. Furthermore, the deformity is just as frequently seen in cases of normal delivery as abnormal; and instead of there being any evidence of muscular contraction, there is usually excessively free motion in the hip excepting abduction. Abduction is of course limited, as the adductors are made tense by the abnormal position of the head of the femur on the dorsum of the ilium.

## SYMPTOMS AND DIAGNOSIS.

The diagnosis of the condition is usually not made until the child begins to make efforts at walking, excepting the occasional instances where it is noticed that there is an abnormal wideness of the perineum.





Fig. 5.—R. N. Skiagraph before treatment.



Fig. 6.—R. N., eighteen months after reduction, and after all retentive apparatus has been removed.



Fig. 8.—M. G. Skiagraph shows congenital dislocation of both hips.

There are three varieties of dislocation: Anterior, superior, and posterior, all of which are rare excepting the latter. In unilateral posterior dislocation owing to the dislocated limb being shorter than its fellow, there is a limp and a lateral curvature of the spine. Owing to the passage of the head onto the ilium, the pelvis is tilted forward and a compensatory lordosis of the lumbar region is present. On examination it is found that the dislocated limb is shorter by actual measurement, there is an absence of the head of the femur in the acetabulum, and it is found to be present on the dorsum of the ilium. The trochanter is above Nélaton's line. Usually the gluteal muscles and those of the thigh are less developed than those of the opposite side.\* The movements of the joint are excessively free except abduction. The trochanter can be felt to move up and down on traction and relaxation of the extremity.

In double dislocation the patient walks with a characteristic waddle or swaying from side to side. There is marked lordosis and tilting of the pelvis forward, owing to the centre of support being posterior to the centre of gravity of the superimposed body. The perineum is broadened. On examination the trochanter and head are found to be displaced as described above. On palpation of the trochanter, while the extremity is worked up and down, the trochanter can be felt to move under the palpating hand.

#### TREATMENT.

The treatment consists in reducing the femur and retaining it in the acetabulum. Reduction is comparatively easy in very young children, but it becomes more difficult as the child grows older, and infinitely more difficult to retain in position, as the acetabulum does not enlarge in proportion to the head of the femur unless the femoral head is in the acetabulum; on the contrary, the acetabulum becomes almost filled, the rim is shallow, the shape is triangular and the size is small.

The early treatment consisted in various corsets, pelvic bands and other mechanical appliances, none of which was very successful until the case of Buckminster Brown's report, in 1885, in which he obtained a perfect result by continuous extension prolonged over a year's time. In this case he had an exceptional patient, and the parents were intelligent, carrying out his instructions to the letter.

Operative correction was also extensively employed for some time, the operation of Hoffa and Lorenz's modification of Hoffa's operation being most successful. Nothing can at the present time be added to the discussion of the operative treatment of congenital dislocation of the hip by Robert W. Lovett as far back as 1895.\*\* "Operative treatment was employed very early, even in the time of

\*Stimson: "Fractures and Dislocations."

\*\*Ashhurst: "International Encyclopedia of Surgery," Vol. VII.



Guérin, who practised tenotomy of the peritrochanteric muscles with comparatively little relief. Subcutaneous operations, with or without extension, were performed by Bouvier, Pravaz, Corridge and Brodhurst. Barwell revived the old operation of Guérin and reported good results. Koenig and Hueter attempted elaborate operations for covering the head of the femur with periosteum detached from the ilium, but no one operation met with extended acceptance. The results of excision have not on the whole been satisfactory. In the first place, a stiff joint is likely to result from the procedure; in the second place, a certain amount of shortening is necessitated. It is not worth while to enter upon the details of



Fig. 1.—G. G. Davis's method of reducing congenital dislocation of hip (Episcopal Hospital).

these operations which have not realized the expectations formed of them."

At the present time the bloodless method introduced by Paci and modified and popularized by Lorenz or that of G. G. Davis is almost exclusively used, except in children over eight or nine years of age in whom tenotomy or, as in some cases, open operation has to be performed.

The cases discussed below, were treated in the Orthopedic Department of the Episcopal Hospital on the service of Dr. A. P. C. Ashhurst, and I take this opportunity of thanking him for the loan of the accompanying photographs and skiagraphs. The method of G. G. Davis was used to the exclusion of all others. The procedure as described in Ashhurst's "Surgery" (1914) is as follows: "The patient is placed prone on the table and the thigh is flexed until it lies alongside the chest, with the knee in the axilla. This brings the head of the femur below but still posterior to the acetabulum. Then

the adductors are gradually stretched by manual pressure downward on the great trochanter (Fig. 1). When these structures have been stretched enough to allow the groin to come in contact with the table, the head of the femur may jump from the posterior to the anterior plane of the pelvis with an audible and palpable click. If not, the flexion of the thigh is slightly diminished (*i. e.*, it is drawn a little away from the chest) and its abduction is slightly increased by raising the knee a short distance away from the table. Pressure downward on the great trochanter is continued until the head of the femur can be felt by the finger in the groin. If reduction cannot be procured at the first attempt without the use of unjustifiable force, it is better to dress the limb in the fullest abduction possible and make another attempt several weeks later, if necessary, after subcutaneous division of the adductor muscles, close to the pubis."

If reposition has taken place it can be confirmed by the following signs: (1) By hearing or feeling the head of the femur drop into the acetabulum; (2) by reproducing the luxation and again correcting it; (3) the leg cannot be extended on the thigh as the hamstring muscles are made tense, owing to the head of the femur being displaced in a direction distal to their attachment; (4) the femoral head can be palpated in its normal position, and can no longer be palpated in its original abnormal position; and (5) by the *x*-ray.

By this method reduction is usually quite easy and there is practically no danger of fracturing the femur unless enormous force is used.

While the dislocation is easily reduced it is quite difficult to retain the head of the femur in the acetabulum, and unless held in a certain position luxation is almost sure to recur immediately. We have dressed all our cases with plaster of Paris, surrounding the pelvis from a point above the crest of the ilium to below the knee-joint, with the thigh abducted beyond a right angle with the sagittal plane of the body (*i. e.*, extended about 20° beyond the coronal plane). The patient is dressed with the thigh in external rotation (Fig. 2), but is later placed on a Bradford frame and the frame is raised one or two feet above the level of the bed by means of a support under each end, and the foot and leg are allowed to drop over the edge of the frame, thus correcting external rotation (Fig. 3). The inward rotation causes the head to produce pressure on the bottom of the acetabular cavity, which is shallow and requires pressure to deepen it. This effect is augmented by the child being made to 'walk' after the first two months, while being supported by an attendant, as described by Lorenz. This position of the thigh is maintained for from four to six months. "At the end of this time unless relaxation has occurred, or is im-

minent, the abduction may be diminished gradually and the thigh dressed in a less awkward position" (Ashhurst). The thigh is gradually brought down to its normal position in about eighteen months by repeated casts. If relaxation occurs it is kept in plaster for a similar, or longer time, from that unfortunate accident.



Fig. 2.—Plaster dressing after reduction of congenital dislocation of both hips. Note external rotation.

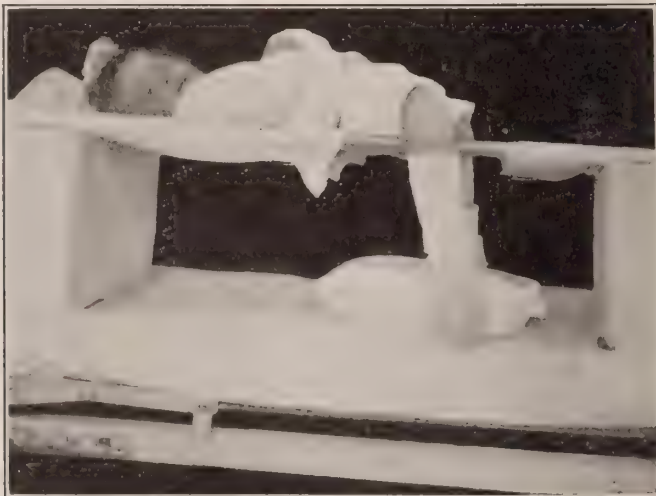


Fig. 3.—Position of patient on Bradford frame. Cast prevents lateral bars from cutting thigh.



All our cases are taught to 'walk' in a chair at the end of about two or three months (Fig. 4). This chair is a rolling box, six to eight inches high, depending on the length of the child's leg, with a support anterior and posterior, connected by straps which support the child under its arms as it sits astride the box, and propels itself by means of pushing on the floor with its feet.

CASE I.—Robert U., aged two years. Family and personal history negative. The mother noticed that when the child was a few months old it held its left lower extremity in adduction and would cry out when it was abducted. The patient had never learned to walk, but in attempts to walk with support, walked on the toes of the affected extremity, with the foot in marked equinus. This equinus deformity could not be overcome manually. The child was admitted to the hospital on August 30th, 1912. The physical examination showed him to be a well-developed and well-nourished boy. In addition to the typical signs of congenital dislocation of the left femur there was rigid adduction, and it was



Fig. 4.—Chair used by child while thigh and pelvis are in the cast.

very difficult to produce abduction, though the child did not cry when efforts at abduction were made, as the mother had described. The skiagraph confirmed the diagnosis of dislocation of the left femoral head from the acetabulum (Fig. 5). On September 10th, 1912, the femur was reduced by Davis's method and cast applied. Tenotomy of the adductors was necessary, and reduction was quite difficult. The *x*-rays showed the head of the femur to be in perfect position. The patient was discharged on October 7th, 1912, with the cast on. By the end of November he had learned to walk with support.

January 9th, 1913. The plaster of Paris was changed and the limb put up in full extension, and about 30° abduction; there seemed to be no tendency for relaxation to occur. It was noted at this time that the heel begins to touch the floor in walking.

On March 6th, 1913, six months after operation, it was noted that the child had been walking alone for one month. It was observed, however, that the limb was constantly rotated outward in walking, and that the foot was in valgus deformity. It seemed probable that an unnoticed attack of anterior poliomyelitis had occurred before the child attempted to walk, and that this accounted for the unusual condition noted above—namely, the walking on the toes of the foot of the dislocated extremity, with the foot in a position of rigid equinus. In April, therefore, a brace was applied, such as is used in cases of infantile paralysis, to correct the outward rotation and the talipes valgus, and with this the child was able to walk much better.

The head of the femur remains in the acetabulum (Fig. 6) and now, nearly



Fig. 7.—M. G. Note breadth of perineum.

eighteen months after reduction, and one year after the discontinuance of all retentive apparatus, it is not at all likely that relaxation will take place.

CASE II.—Mildred G., aged two years. Family history negative. Child had never been sick except an attack of measles just before admission to the hospital. The mother had had no suspicion of the child's condition until she began to walk, when she noticed that she walked with a waddling gait (Fig. 7). The patient was admitted to the hospital May 13th, 1913. On admission the child is found to be fairly well-developed except that she has all the symptoms and signs of congenital dislocation of both hips, which diagnosis was confirmed by the x-rays (Fig. 8). On May 21st both femora were reduced by Davis's method and plaster-of-Paris casts applied as described above. The skiagraph showed the head of the left femur to be in the acetabulum. The right was almost in. The feet were then dropped over the side of the Bradford frame, correcting the external rotation, and August 16th the head of the right femur is shown by the skiagraph to be in position. The cast was removed and a new one applied September 26th. Before applying this cast, the extremi-

ties were brought down several degrees. New casts were applied after this at intervals of about every six weeks, having less abduction of the thighs each time until the time of her discharge, January 6th, 1914, when the abduction was only about  $45^{\circ}$  from the saggital plane of the body; and she was going all about the ward on her roller chair. By the end of January she was able to walk with support, and waddled contentedly around with her plaster-of-Paris dressing still in place (Fig. 9). In April, 1914, nearly a year after reduction, neither hip shows any tendency to relaxation, and very soon the plaster-of-Paris dressing can be discontinued.

CASE III.—Margaret B., aged two and one-half years. The patient has always been in splendid health; her only sickness having been a mild attack of measles in early infancy. Her mother knew of nothing being wrong with her hips until she began to walk. Her mother very aptly described her gait as 'waddling.' The child was admitted to the hospital on November 3rd, 1913.



Fig. 9.—M. G. walking with cast still in position.

The physical examination reveals a very well-developed and well-nourished child with no demonstrable pathology excepting the head of each femur being dislocated onto the dorsum ilii, and the characteristic symptoms and physical signs associated with the condition: waddling gait, broad perineum, great trochanter freely movable up and down on extension and relaxation of the leg, pelvis tilted forward, and lumbar lordosis. Both femora were reduced November 5th, 1913, by Davis's method. She remained on the Bradford frame for two months and was then taught to walk in the rolling chair, in which she soon learned to go all about the ward. The *x*-rays show the femoral heads to be in perfect position. In February, 1914, a new cast was applied and the extremities were brought down a few degrees; the third cast was applied April 22nd, 1914, and the thigh placed in abduction of about  $25^{\circ}$  only; this will be



repeated at intervals until the thighs are brought nearly into apposition, when the casts will be dispensed with.

CASE IV.—Margaret K., aged twenty months. The child was bottle-fed but quite healthy. While the child was learning to walk its mother noticed that it limped, this being the first suspicion she had of the child not being perfectly normal in every respect. She took her daughter to the orthopedic dispensary of this hospital from which it was sent to the ward, with the diagnosis of congenital dislocation of the left hip. All the symptoms and signs of congenital dislocation of the hip were present. On November 26th, 1913, the femur was reduced by Davis's method, and put in plaster-of-Paris cast as described above. The skiagraph shows the head of the femur to be in perfect position.

At the end of January a new gypsum case was applied, the flexion of the thighs being slightly reduced.

February 3rd, 1914. Discharged from ward.

March 2nd. Walks well in the gypsum case, with a little support; the femoral heads are distinctly palpable anteriorly, beneath Poupart's ligament, but seem a little closer than normal to the anterior superior spines of the ilium. A skiagraph, however, shows them in the sockets.

April 29th. New cast applied, with each thigh in about 25° abduction. The reduction is maintained.

Episcopal Hospital.

TICS.

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A tic is an interesting and singular condition, by no means of infrequent occurrence. A study of its characteristics and pathogenesis is instructive and opens up a wide field for reflection and speculation concerning its fundamental origin and development.

The names most prominently associated with the study and the elucidation of the problem of the tics include those of Friedreich, Trousseau, Charcot, Tourette, Guinon, Oppenheim, Brissaud, Meige and Feindel, Pitres, Noir and others.

Tic has had various names applied to it in the way of synonyms. Thus we have the 'habit spasms' (of the English), habit chorea (improperly called chorea), *Errinerungskraempfe* (Friedreich), *maladie des tics impulsifs* (Marina-Jolly), myospasia impulsiva, *maladie des tics*, and *tic général*.

*Definition and Description.*—A tic, as defined by Brissaud, is a physiological act, which, although originally functional and purposeful in character, has in the course of time become a habit, which is executed in a purposeless and meaningless manner. A physiological act, produced at first consciously and purposely as a psychomotor defense reaction to certain external stimuli or ideas, is repeatedly performed as a necessary protective response to the external stimulus or idea which arouses the psychomotor reaction. So frequently is this physiological psychomotor reaction performed, that it becomes a habit which is, of course, pathological, is brought into activity by no adequate external process or idea, and is apparently purposeless and meaningless from a biological and physiological standpoint.

The tic is not a purely motor act. On the other hand the psychic aspect of the condition is extremely important and much in the foreground. There is an irrestrainable, irresistible psychomotor impulse to execute the particular act or acts in question. The performance of the act may be inhibited to a certain extent by the exercise of the will, but this conscious control of the will over the act is limited. Attempts to inhibit the execution of the act, when the impulse for its execution is present, is accompanied by a very disagreeable feeling of psychic tension, mental distress, pain and restless anxiety which increases in degree until the particular motor

explosion occurs. This latter finally relieves the peculiar state of psychic tension and discomfort.

We thus see that tics are not pure motor reactions, but have an intimate and important psychic aspect. A tic is therefore a true psychoneurosis. There are, as we see, two distinct components to the origin and execution of the tic. One is motor; the other is mental.

On the motor side we note a decided tendency toward the repetition of a certain motor reaction. This motor reaction consists of the contraction of certain muscles. The muscles which are affected in tic movements are not those which necessarily receive their nerve supply from a single nerve trunk, but are muscles which, because of their function, are physiologically related to one another and may derive their nerve supply from several different nerves. Thus the limitation is not anatomical but physiological. The coordinated movements which characterize a tic have become habitual and automatic, and occur without any apparent purpose or meaning, and have become dissociated from the external stimulus or idea which originally was the inciting cause of the movement which we see repeated in the tic. The tic-movements are frequent or even constant, and occur at irregular intervals. They are imperative, short, abrupt and forcible. They are followed by definite and, as a rule, prolonged periods of rest. The movements tend to recur in attacks. These attacks, occurring at frequent but irregular intervals, show a variation in degree, frequency and duration with which they occur. But there is always observed a purposeful and coordinated character to the movement.

Tics usually cease their activity during the sleeping state, although Oppenheim has observed their occurrence during sleep. Distraction of the attention may result in the temporary cessation of the movement. And, as stated above, conscious efforts at voluntary control over and inhibition of the apparently purposeless movements may result in a certain amount of positive restraining influence over the performance of the movements. It is interesting to note that emotional disturbances and states of fatigue cause an increase in the number as well as in the severity of the tic attacks. This is probably due to the fact that in such mental states, induced by fatigue and emotions, there is a loss of will-power, of self-control and of conscious inhibition, with a condition of increased nervous irritability and reaction. Absent-mindedness and inability to concentrate the attention occur because of the great degree of attention devoted to the tic. We find that ticquers often shun society because of the consciousness of their condition and the sensitiveness of their feelings.

It is very significant that a feeling of tension and a desire for reproduction of the tic frequently precedes the reproduction of the



movement. This feeling is unappeasable, insuppressible. As soon as the tic has been executed, frequently in a violent, impetuous, explosive outbreak, there is a pronounced feeling of relief and satisfaction. If the unfortunate patient makes purposive movements to suppress the tic, he soon experiences a feeling of dissatisfaction and distress, of a very disagreeable and painful nature, which tends to increase in severity until, finally, by the forced performance of the motor process, satisfaction is obtained. The mental element is predominant. It is obvious that there must be a definite reason for the occurrence and repetition of the tic. It seems that the tic is fundamentally and primarily the result of subconscious mental processes; that it is a psychic condition accompanied by an associated motor process.

#### VARIETIES OF TICS.

Tics vary in the number and extent of movements and in their variety or location. Tics may be (1) isolated or solitary, in which case there is a single, coordinated movement or localized tic, confined to a definite part of the body, as is seen, for example, in winking of the eye-lids; (2) compound or complex tics may occur, in which case several contractions occur simultaneously in different parts of the body; or we may have (3) a general tic, in which there is a general movement of the whole body.

It must be appreciated at once that the number of possible tics is considerable. This number is equal to the number of physiologically acting muscles. Most frequently, however, these violent, convulsive spasms of momentary duration which are characteristic of tics, occur in the muscles of the face, neck and upper extremities. Tics of the facial muscles are of greatest frequency. They may be unilateral or bilateral. They are usually unilateral. When bilateral, they are most usually not symmetrical. The muscles of the eye-lids, of the tongue, of the nose, of mastication may be affected. Biting of the nails or the lips may occur. Blinking, frowning, raising the eyebrows, peculiar grimaces may occur. Affection of the muscles of the neck may produce so-called mental torticollis (*spasmus nutans*, nodding spasm). Involvement of the muscles of the shoulders and arm produce sudden twisting of the head, shrugging of the shoulders, jerking of the hands. The muscles of the lower extremities are infrequently involved. Affection of the trunk muscles may be present, in which case we have the salaam convulsions or movements when the muscles of the abdomen are involved. The diaphragm (as in *singultus* or hiccough), the muscles of articulation and others are often affected, so that as a consequence various complicated respiratory spasms may appear, such as spasmodic acceleration or forced respiration, gurgling noises, eructations, yawning (called also *chasmus* or *oscedo*), sneez-

ing spasm (called also sternutatio convulsiva or ptarmus), laughing or weeping spasms, coughing spasm, barking, etc.

The *maladie de tic convulsif* or *maladie des tics impulsifs* or Gilles de la Tourette's disease, classed by some as, for instance, Struempell, under hysteria, is an extreme form of tic occurring in children, and is characterized by (1) twitching of the facial muscles; (2) systematic movements, frequently or constantly repeated in the same manner; (3) echolalia, coprolalia, and at times echokinesis, which terms will be explained below; and sometimes by (4) fixed ideas or imperative actions; (5) progressive mental weakness and terminal dementia occur.

Echolalia is characterized by the tendency on the part of ticquers to mimic and to repeat over and over again certain words, sentences or phrases which have just been uttered by others in their presence, or perhaps by themselves. Coprolalia is a characteristic symptom in Gilles de la Tourette's disease. It consists in the explosive, forced utterances of improper, vulgar, or obscene words, phrases or sentences which are interjected suddenly and unexplainably in the course of the patient's conversation or conduct. The name *tic de pensée* has been applied to the involuntary exclamation of a thought which the patient did not desire to express; in this way, as it were, letting the cat (the hidden thought) out of the bag. These utterances are abrupt, irresistible, impulsive, and impetuous. These tics of speech, as they are called, occur independent of time, place, and association. The individual has no absolute control over them and cannot entirely inhibit their expression, although he may thoroughly appreciate the impropriety, the incongruity and the indelicacy of his conduct, and may feel very much abashed by his statements. Echokinesis consists in the immediate and repeated performance of certain movements which the ticquer has been asked to perform, and the mimicking and repetition of the movements observed.

In the writer's opinion the distinction between *maladie des tics* and ordinary tic is purely arbitrary and artificial. The *maladie des tics* is merely an intensified form, with tics of speech and the psychasthenic-hysterical make-up being prominently in the foreground.

Certain stereotyped movements may appear and be repeated over and over again. There may be touching of the nose, stroking of the chin or beard, throwing of the head from side to side, nodding movements of the head, clapping of the hands, opening of the mouth, stamping of the feet, swallowing, spitting, gulping, scratching, sucking, licking, sniffing, grinning, springing, clearing the throat, snapping the fingers, etc. etc.

The onset of tic is slow; likewise the evolution of the *maladie des tics* is gradual. First, the facial muscles alone may be involved. This may spread to involve the muscles of the neck and shoulders

(due especially to the involvement of the sternomastoid), and then the trunk and the extremities; and the muscles of speech and of respiration may be affected. When well-developed and general, tics may occur in all parts at the same time or in rapid succession. Obsessive and abnormal impulses, psychasthenic, neurasthenic, or hysterical symptoms may complicate the picture. At first, the purposive character of the tic may not be noticed. After some time, perhaps even years, a purposive aspect is seen, and the movement is recognized as an expression of emotion, habitual and intentional.

The frequency of involvement of the muscles of articulation, phonation and respiration may give rise to impulsions to utter inarticulate sounds or words. Besides coprolalia, echolalia and echokinesis mentioned above, and such sounds as sniffing, smacking of the lips, hissing, etc., various inarticulate cries, frequently in imitation of the calls of animals, may occur; and sometimes there is an explosive utterance, repeated time and again, of certain newly-coined, senseless words (called neologisms).

Although the tic-movements are usually clonic, the muscular spasm may sometimes be of a tonic nature, so that forced attitudes may appear. Mental torticollis or wry-neck is not of infrequent occurrence.

In individuals without defective mentality the intelligence is generally unaffected. In other cases, with marked neurasthenic, psychasthenic and hysterical symptoms, various fears, doubts and obsessions may be present. Actual delusions may occur, and in certain cases insanity may develop on the same psychopathic basis which permitted the development of the tics. Consequently ticquers may be dominated by certain morbid ideas, of an imperative, ideational nature. These are, of course, true obsessions, characteristic of psychasthenia. Thus there may be a morbid impulse to count steps, to touch every post in passing, etc.; or there may be an impulse to collect various articles, or the tendency to perform certain peculiar mannerisms. When doubts are coexistent, the choice of a tie or collar in the morning while dressing may give rise to a serious problem which it may take the individual some time to solve. The latter condition, generally known as *folie du doute*, is also included under the term 'psychasthenia.'

While on the one hand, as already explained, these tics are only to a very limited extent under the control of the will, it is well known, on the other hand, that systematic occupation, distraction and external concentration of the attention have a considerable influence in repressing tics. Attention devoted to the tic tends to increase its frequency, duration and severity. Likewise, as mentioned above, fatigue, emotional upset and states of irritability and anxiety increase it. When the individual is alone, these tics may cease for a long time. But so soon as social relations are resumed,



during emotional excitement, under mental stress, strain or conflict, they tend to recur. Again, voluntary movements have quite a soothing effect upon tics.

There may be a decided variation in the intensity of the tics. Remissions and exacerbations occur.

We may mention here the saltatory spasm (Bamberger), characterized by a jumping or springing motion when the patient attempts to stand, as a result of violent contractions of the muscles of the leg. It occurs in neurotic individuals, more frequently in males. It is a transitory condition, as a rule, but in some cases may last for years. A similar affection occurs as an epidemic neurosis and goes by the name of *latah* (in Malay) and of *myriachit* (in Siberia), and occurs also in the Jumpers of Maine and Canada. In the case of the Jumpers or the Jumping Frenchmen of New England and Canada (Beard and Thornton), the affected individuals jump violently and give vent to loud explosive cries or sounds, are very suggestible, and may develop echolalia and echokinesis to a marked degree. *Latah* and *myriachit* are characterized by the tendency to mimic everything seen or heard. It is argued by some that the professional or occupational neuroses are a form of tic. Whether this is the fundamental trouble in the professional neuroses is open to doubt. But at any rate the occupational neuroses are certainly closely allied to tics, and may best be viewed as a special and peculiar type of tic.

It is noteworthy that tic may make its appearance in the form of stammering; but, of course, stammering is by no means in all cases of tic origin, although intimately related to it.

#### ETIOLOGY OF TICS.

It is found that a neuropathic or psychopathic condition, generally hereditary, sometimes acquired, is the basic, underlying condition. Other members of the family are frequently affected with some variety of functional nervous disturbance. The patients themselves, as explained above, very often have other nervous disturbances, especially morbid impulses and obsessions of a psychasthenic nature. There is a lack of inhibition and control of the automatic movements under control of the nervous system. Hence tics generally occur in defective or disturbed states of action of the nervous system. We find that tics are frequent in children of nervous or neuropathic constitution, in the mentally defective, and in the insane. Although patients suffering from tics are, of course, not insane, insanity may, however, occasionally occur amongst ticquers later in life. As a rule, tic usually begins in early life, at any rate before maturity, especially between the ages of seven and fifteen. Amongst important exciting causes we must include mental excitement or trauma, bad training in childhood, and disturbances of

an emotional nature. Overstrain and infection are also mentioned. Mental conflict is always an important factor.

Under the heading of heredity it may be mentioned that even direct heredity has been reported. However, the general neuro-pathic heredity and not the tic itself is inherited, the latter developing by imitation, or from some external or internal exciting cause. Improper training and imitation are important. It is argued by some that the tic tendency may be inherited. The particular variety of tic from which a patient suffers is acquired. It may be the result of an external irritation of some sort, or may develop as a consequence of a certain idea or mental conflict, or both the physical and psychic factors may be antecedent.

#### DIAGNOSIS.

Tic must be differentiated from the following conditions:—

(1) *Jacksonian epilepsy*. The latter is easily diagnosed by the observation of a single attack. The history is entirely different.

(2) *Chorea*. The diagnosis here is easy. Chorea does not involve physiologically associated muscle groups, the movements are not purposive, coordinated, or systematic, the characteristic psychic condition is not present, etc. The prognosis and treatment are entirely different.

(3) *Tic-like movements* in hysteric, psychasthenic, and insane conditions. Here, especially in hysteria, the condition may disappear suddenly, but never so in tic; moreover, these conditions may be influenced by suggestion, which is not the case in true tic. Again, the impetuosity is apt to be absent in these states. In hysteria, although somewhat similar movements may occur, they are generally associated with crises, the stigmata may be present, and there is generally no echolalia or coprolalia. In rhythmical or hysterical chorea the movements may be very similar to tics, but they are not tics since the specific element is lacking. They are merely the somatic manifestations of hysteria.

(4) *Reflex spasm*. The spasms are reflex acts. They are reflex muscular contractions, the result of pathological irritation somewhere along the bulbar or spinal reflex arc—in the muscle or the nerve, afferent, efferent or central. The reflex spasm is a clonic convulsion of a single muscle or group of muscles. It is involuntary, directly physicochemical and mechanical in origin. It is purposeless, incoordinate, limited to a certain special anatomical nerve area (a single nerve, as a rule); it is not influenced by psychic factors (such as attention, distraction, will-power); it may be painful, and there is no psychic aspect to the condition (no preceding irresistible impulse, no subsequent sense of relief, no special accompanying mental state). It may also persist during sleep, whereas tic in almost all cases ceases during sleep.

(5) *Paramyoclonus multiplex* or *myoclonia* (Friedreich). In myoclonia we have clonic spasms occurring in symmetrical groups of the muscles of the arms or legs, in paroxysmal attacks, without disturbance of consciousness, plus increase in the tendon reflexes. The term is used in an indefinite manner, frequently with confusion of cases. True paramyoclonus shows genuine, lightning-like contractions in single muscles, frequently with no observable effect of movement, affecting especially the muscles of the trunk and extremities.

There are some neurologists who would make a distinction between the so-called habit spasms and the tics. According to this division a habit spasm is not forcible, not irresistible, and is a simple, local, spasmodic movement, without explosive utterances or definite psychic symptoms added to the local spasmodic movements. These habit spasms are at first infrequent, later increase in frequency, or even become continuous. They are generally transient, lasting for a few months or longer. At times, however, they persist. It must be appreciated, on reflection, that the line of demarcation between the so-called habit spasms and tics is essentially one of degree alone. The habit spasms are but a less intensified form of tics. The severity of tics varies considerably in degree. The slight and mild forms are extremely common—much more so than the more marked variety.

Habit spasms should, therefore, be considered as true tics, and the term is usually used as a synonym for tic.

#### PROGNOSIS.

The prognosis depends on the age of the patient, the duration of the condition, the mental condition of the ticquer, and the time and character of the treatment. It is important to mention again that there are slight, mild and severe forms, and that the slight and mild forms are very frequent.

The slight forms, occurring in children, may be stopped early by training and correction, and at times by threats, although it is not advisable to resort to threats, which are apt to aggravate the condition. As will be shown under the heading of treatment, the will to be cured may effect a cure, as Meige and Feindel believe. We must differentiate between a cure and a spontaneous temporary remission, in which latter case there is a great probability of a relapse taking place. Nor should we forget that one variety of tic may disappear only to be later replaced by another. In mentally normal children, when treatment is begun early with proper training, cure may be rapidly effected. On the other hand, the results are most unsatisfactory where cooperation is not obtainable and where defective mentality is present. It must be said that



most cases are chronic in nature. Some last for months, while others, much too frequently, last a lifetime.

Oppenheim\* reports a case of general tic in a young girl in whom with the onset of the first menstrual epoch there was a disappearance of the tic.

#### PATHOLOGY.

The pathology of the condition is unknown. According to Meige and Feindel there may be a congenital anomaly, an arrest or perhaps a defect of development of the cortical or the subcortical association paths. These changes are, however, so minute that we have not as yet been able to detect them. Thus we see that an anatomical, physicochemical basis may, of course, be present. But at most this is purely speculative. And, even granted that this congenital defective condition is present, it seems to the writer that it would not add anything to the true understanding of the condition, nor would it help us in our efforts at curative treatment.

#### PATHOGENESIS.

As mentioned previously, there is some external irritation or psychic cause which brings about the psychomotor defense reaction. This is repeated over and over again, until finally it becomes a fixed habit of an impulsive nature, and occurs without being called into activity by the original exciting cause. Thus it becomes subconscious or unconscious, partaking of the nature of automatism. The cause is unconscious—forgotten. For example, an annoying, irritative ocular condition may give rise to blinking. This is repeated frequently in a defensive manner and may finally continue to be repeated over and over again, although the original irritative cause may have long since been removed.

The relation of tics to mental defectiveness, the psychoneuroses and insanity, and their occurrence in those burdened with a neuropathic or psychopathic heredity and a neuropathic or psychopathic constitution, has already been referred to several times.

Meige and Feindel believe there is a weakness of will-power. Breseler considers tic a motor reaction to original mental shock—a psychic defense reaction of expression. Tics, therefore, according to this view, would represent certain feelings of the individual—his loves and his hates, his likes and his dislikes, his wishes and his fears, his cravings and his disappointments, etc. In other words, the ticquer feels by his tic. It is the means of expression of certain psychic defense reactions. This is somewhat similar to the Freudian idea, as explained below. There is believed to be present in this condition a lack of control or inhibition over the lower neurons normally regulated by the higher coordinating centres—over automatic activities.

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\*Textbook of Nervous Diseases, Vol. II, 1911, under the subject of "Tic."

The Freudians have endeavored to explain tics from their standpoint. Freud has delimited what he calls obsessional or compulsion neurosis (*Zwangsneurosis*), which is classed under psychasthenia by the French and under neurasthenia by others. The Freudians regard this as a distinct neurosis, sometimes complicated by neurasthenic or hysterical symptoms. The characteristic symptom is a feeling of compulsion. The symptoms may be motor (obsessional acts, impulses), sensory (obsessional hallucinations or sensations), ideational (obsessions), and affective (obsessive emotions, particularly doubt and fear). In this condition we find that there is an excessive psychical significance attached to certain thoughts. Obsessions are characterized by dissociations from the main personality. They thus exist in the unconsciousness. The original unconscious mental processes have brought about, by displacement, an excess of psychical significance to these thoughts. Ernest Jones\* states that Freud found, by his work in psychoanalysis, that obsessions represented, symbolically, the return of self-reproaches of ancient, infantile and early childhood origin, which had been repressed and buried until the obsession made its appearance. "They always refer to active sexual performances or tendencies"; and as Jones further explains, "there occurs early in life an exaggerated divorce between the instincts of hate and love, and the conflict and antagonism between the two dominate the most important reactions of the person. A fundamental state of doubt, an incapacity for decision, results from this paralyzing doubt. The patient oscillates between the two conditions of not being able to act (when he wants to), and being obliged to act (when he doesn't want to). The symptom symbolizes the conflicting forces. These are not, as in hysteria, fused into a compromise-formation, but come to separate and alternating expression; one set of manifestations, therefore, symbolizes the repressed forces, another the repressing."

To put the matter plainly, the Freudians contend that obsessions are symbolical representations of the repressed sexual activities and tendencies of infantile and early childhood origin. It must be remembered that the Freudians employ the term sexual in a very broad sense, including under it the most indirect and distant physical, mental and moral reverberations, conscious or unconscious, of the relation between the sexes. The sexual impulse is here conceived of as having incestuous, bisexual and polymorphous perverse sexual tendencies. The word sexual is not only used as synonymous with love, but practically all emotional surgings, all feelings, all affectivity, all sense-cravings and bodily heavings are classed by certain Freudians as sexual. This latter interpretation and exten-

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\*White and Jelliffe's "Modern Treatment of Nervous and Mental Diseases," pp. 408-409. 1913.

sion of the connotation generally accorded by us to the term sexual, we surely have no right to give it.

The writer cannot understand how this position can be maintained. Jones asserts that the tics or habit spasms are probably of this same nature. Moreover, he tells us that "familiar examples of compulsion in a slight degree are the obsessive impulses to touch every other rail of an iron fence as one walks past, to step on the cracks between the flag-stones of the pavement, or not to step on them, and so on." A little reflection will show us the impossibility and absurdity of viewing all these conditions as being fundamentally of sexual origin. Let us follow the argument. If tics are of sexual derivation, as the Freudians here openly maintain, then it must follow that those familiar examples of compulsion, such as the obsessive impulse to touch every other post, etc., are likewise of sexual origin. This conclusion is forced upon us, since, even according to Jones, the only difference between the marked tics and the lesser manifestations is one of degree. Now, these slighter impulsive tendencies to which we have here referred are very frequent in all children and by no means infrequent in grown-ups. They are habitual movements, which may be of transient duration only or may, by repeated performance, develop into more or less fixed habits. If, then, these habits are of sexual significance, then all other habits, especially if associated with a certain degree of consciousness or awareness, are in like manner symbolical of the past infantile and early childhood sexual activities and tendencies. This conclusion is, as is seen, inevitable, if we believe in the Freudian theory of the pathogenesis of the tics. However, since this leads us to a *reductio ad absurdum*, we must, of course, reject the explanation which has been offered by the Freudian school.

The writer will agree with the Freudians that there must be a cause for the appearance of these tics. This cause existed in the past. It has in the course of time been forgotten, but still exists somewhere in the subconsciousness or memory. This forgetting has been brought about by a process of dissociation from the original exciting cause. But the writer will not agree that this dissociation has been, of necessity, brought about by repression on the part of the individual, that by psychoanalysis the condition can be traced back to the sexual activities or tendencies of infantile or early childhood origin, or that the condition may be cured when the original cause is made known to the patient through psychoanalysis, without the training of the will so necessary in this condition.

Thus the analytic tendency of the Freudian school is to be highly recommended. But this analysis should not be limited to sexual



analysis, but should include a consideration of all of man's instincts. Nor should the analysis be limited to psychic factors alone, but should be viewed from a psychobiological standpoint. In this way only will all antecedent causative factors—physical and mental—be included in our analytic observation and speculation.

*(To be concluded.)*

## DERMOID CYSTS OF THE SACROCOCCYGEAL REGION.

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Dermoids are cystic tumors, congenital in origin. They were first studied and described by Lebert, and since then much has been written on their origin, pathology and treatment. Although all the tissues included in the formation of these tumors are normal to the body, yet under these conditions they are abnormally placed, therefore becoming pathological tissues. The simplest form of these tumors are globular sacs, the inner wall of which is lined by dermal cells from which fine cilia, or coarse hair may grow and be shed, forming bundles which work their way to the surface as soon as sinuses have been formed. The walls show different structures of the skin, more or less definitely developed, and also contain sebaceous glands and often sweat glands, whose excretions may slowly distend the cyst. The most frequent location of this form of dermoids is in or near the lines, where during the early embryonic life coalescence takes place between the two cutaneous surfaces. These are termed by some authors as sequestration dermoids and are the most frequent form found in the post-sacroccygeal region.

When the lateral halves of the embryo are brought together, closing in the posterior cleft, there is a defect in the dermal apposition, and some of its cells are misplaced and buried in deeper tissues, which group of cells is then termed 'cell rests.' These may lie dormant for years without giving any signs or symptoms of Nature's mistake. Traumatic dermoids may occur in this region, but are most frequent in the hands and feet, as they most frequently follow puncture wounds, the object producing the wound having carried some skin cells with it into deeper tissues.

Dermoids of this region may be mistaken for, and are (although very rarely so) complicated by spina bifida, and it is sometimes advisable to make an exploratory puncture before operation. These cysts may be multiple, but are usually single.

Post-rectal dermoids or those occurring just anterior to the sacrum and coccyx, between these bones and the rectum, are very rare. They very often go unnoticed until puberty or perhaps late adult life. It is very singular that the contents of these cysts should vary so greatly from those of the former region, in that the post-rectal dermoids frequently contain teeth, while those of the post-sacroccygeal region never do. These tumors present themselves quite frequently as surgical surprises when very large and extend-

ing up behind the pelvic peritoneum, and in the female may be mistaken for a cul-de-sac collection of fluid or an ovarian cyst. These cysts are derived from the neuro-enteric canal in the fetal formation and have no connection with the dermal approximation.

There are no symptoms at first and only until the cyst is distended is the condition recognized. If the trouble is near the skin surface, the patient may give a history of a lump the size of a pea for years, and as it gave no pain, was not tender, and grew exceedingly slow, they thought nothing of it. If they become infected, then as in any abscess there is pain, redness and increased swelling, with rupture and sinus formation. Or, if lanced, a sinus forms anyway, with frequent healing and ruptures as long as it is not treated correctly. The cysts of the post-rectal region from their large size produce pressure symptoms, such as constipation from pressure on rectum, vesical irritation, or pelvic distress from distortion of the genital organs in the female.

This condition must be differentiated from (1) *spina bifida* which, as stated before, may be diagnosed only by resorting to the aspirating needle. (2) *Fistula in ano*. Here we may have considerable difficulty after the sinuses have formed, if they are in the anal region, for although there be no opening found in the bowel by probing, we are not certain such an opening has not existed at some future time. A history of bundles of hair working from the sinus openings would clear this up if we did not look upon it as fallacious, as the writer did when one patient mentioned it while the history was being taken. (3) *Tuberculous condition* after sinuses have formed. The appearance of the patient might aid us here, but when we encounter localized tuberculous lesions in patients, who from general appearance are in perfect health, we have considerable timidity in making a correct diagnosis of these chronic sinuses. Of course, if a probe follows the sinus down to a carious bone with a history of tuberculous infection, then we might feel safe in making a differential diagnosis. The writer may be a little timid, but when he finds doubtful sinuses in the sacrococcygeal region, he is inclined to tell his patients that the sinus might have any one of these sources—tubercular, anal, or congenitally cystic.

What kind of a prognosis can we give these patients? That depends upon the advancement of the condition when seen. The cysts of the post-sacral region seldom reach the surgeon until a sinus has formed and when the cysts are frequently multiple, and those of the post-rectal region only if the cyst becomes large enough to produce symptoms. We can always assure the patient, if fortunately we see the condition before sinus formation, that the cyst will become larger and that a sinus will form sooner or later. While their formation is usually delayed until after puberty, it may become a complication at any time. If the location of the cyst is in



the post-rectal region, it will grow more rapidly, become much larger, may rupture on the surface, into the rectum, or into the peritoneal cavity, and in the female cripple the genital organs by their disarrangement.

After the sinuses are established, it is certain that they will never permanently heal without proper treatment. They will discharge a seropurulent or purulent fluid for some time, and then with the external orifice sealed for a short time, the patient may call himself cured, only to be disappointed in a very short time by the sinus reopening and discharging as before. You can assure your patient that this will continue as long as the seat of trouble remains. There is a possibility of sarcoma springing up in the outer connective-tissue wall and epithelioma of the inner lining of the cyst.

Before taking up the treatment, the writer will report 2 cases which recently came under his care, and which are excellent examples of this condition.

CASE I.—Mr. P., *æt.* thirty-five, resident of Indiana, complained of what his family physician (who is a very able man) had diagnosed as fistula in ano. Seven or eight years ago a swelling appeared on one side of the anus about an inch from the anal margin, which he thought was a boil. This supposed boil ruptured in a few days and discharged a purulent looking fluid for several weeks. The opening then closed and remained so for two or three months, when, after a few days of swelling and tenderness at the former site, the old opening again discharged for some time. This closing and opening had occurred several times since the trouble began. As long as the discharge continued he would have no pain, but was forced to wear a pad, and during the hot season the adjacent skin became very much irritated, almost incapacitating the patient from his farm duties at times. He stated that he had, during the last two years, pulled a small bundle of hairs from one of the openings, two or three times. The examination showed considerable scar tissue in the anal region, where different sinuses had formed and healed. There were three openings discharging, the sinuses of which led to one point. The writer could not, however, find an opening into the rectum. As we often fail to find the rectal opening until the patient is under the anesthetic, and sometimes find no connection with the rectum at all, the writer thought that he was dealing with an anal fistula. At operation when one of the sinuses was laid open on a grooved director, he was surprised to find two small bundles of hair lying within the tract. This put him on his guard, and following up the sinus, he found it to lead to a small cyst cavity, the size of a small hickory nut, the lining membrane of which showed fine hairs growing from its surface. The other two sinuses led to the same cavity. There was no opening into the bowel. The entire cyst wall, together with the sinus walls, was carefully dissected and the wound packed with iodoform gauze to heal by granulation. Ordinarily, he would have closed the wound, but the existing scar tissue would not permit.

CASE II.—Mrs. C., *æt.* fifty, a resident of Illinois. On February 24th, 1914, complained of a small place on her back, which would not heal. She said that at the age of twelve she noticed a hard lump the size of a cherry at this site. It grew very slowly, but gave no trouble until nine years ago, when it became swollen to the size of a small walnut; it was painful and red; it burst and discharged purulent looking fluid for some time. An electric cautery

was then applied to the sinus and it healed in four weeks, the patient thinking she was well. Last November, the trouble recurred and began to point at site of the old opening. This was lanced, drained, and packed with iodoform gauze, and it healed again. Last New Year's day the place was again giving trouble, and again it was lanced and this sinus remained open. She was referred to the writer by her family physician, and on examination he found a small sinus a little below the crest of the ilium about 2 in. to the right of the spine. It was so tender the patient would not allow it to be probed. A diagnosis of congenital cyst or a tuberculous sinus was made. At the operation we found a sinus leading down to a small cyst resembling very much the one found in the previous case. The cyst wall and sinus were completely resected, and the wound closed without drainage.

As to treatment, what should we say? It can be summed up in two words—complete excision. The lance may be applied again and again with only palliative results. The electric cautery would cure if it totally destroyed every cell making up the lining membrane of the cyst and sinuses. Treated by incision, phenol and alcohol and iodoform packing will not cure. Beck's bismuth paste used frequently in chronic sinuses would have no chance at all for a cure. Therefore, if we do not recognize the condition either before or at the time of the operation, we will most surely have these patients coming back to us or going to some other surgeon with a recurrence of their trouble. When we say a complete excision, we should emphasize the word complete. This condition we have already said was due to a few fetal remnant cells, which strayed to distant territory from where they normally belonged. Now what will happen if only a part of these cells is removed and the remaining closed in by sutures? The same condition is bound to recur sooner or later. Therefore, in order to relieve the condition permanently, every one of the foreign cells must be excised and the whole condition thereby absolutely removed.

La Plante Building.

BRADYCARDIA AND TACHYCARDIA IN YOUNG CHILDREN.  
A REPORT OF TWO CASES.

By JOHN ZAHORSKY, M. D., of St. Louis.

CASE I.—Infant, fifteen months old, suffering with typical symptoms of heart block. Only child of healthy parents. Nothing unusual was noticed at birth. Maternal nursing was successful a few months only. Received condensed milk almost entirely until one year old. Attempts to place her on malt preparations were unsuccessful. She grew very slowly, but the parents did not believe anything was wrong with her until three weeks before. She had commenced to walk, but makes no attempt now. The baby has been very restless, looks cyanotic at times and grunts with each expiration. She has always been constipated. In the last few months had received some additional food besides the condensed milk. The stools have been hard; there is no history of diarrhea. Stools were never green. The abdomen has been swollen for several weeks.

Physical examination reveals a small poorly nourished baby. The skin has a marked pallor, with a distinct cyanotic hue. The anterior fontanelle is large, but no other rachitic manifestations are present. She has four teeth. The abdomen is very large, and on palpation the liver is found to reach within one fingerbreadth of the umbilicus. A small umbilical hernia is present. Spleen not palpable. Percussion of abdomen gives tympany everywhere except over the large liver.

The greatest abnormality was found in connection with the circulatory system. The pulse-rate was 54; this never varied in any posture. The child always resented examinations so much that it was impossible to make a complete examination. The visible impulse was in the fifth interspace in the mammillary line. A loud systolic murmur heard all over the chest was present; the second sound was accentuated. The terminal phalanges of the fingers were not clubbed, but dusky red in color.

Weight of the child, 14 lb. 2½ oz.; length 27 in. Hemoglobin, 100 per cent.

The baby was seen one month later and its nutritive condition was better. Pulse-rate, 58. The fontanelle was distended and the liver swollen. The eyes were very prominent.

One month later the parents reported that the baby, in the night, had had an eclamptic seizure. She had been taking small doses of *nux vomica*. No change in pulse-rate. In two months she had gained one pound in weight. Circulation seemed better. She was given potassium iodide for two or three months; arsenic also was tried. *Belladonna* had no effect except to increase the nervousness.

*September 24th, 1913.*—Baby has had diarrhea for three days. The face is very much swollen. Vomited once; pulse the same; was treated by dietetic measures.

*October 25, 1913.*—Had a severe fainting attack ten days ago after eating popcorn; is taking potassium iodide; pulse-rate, 50; liver swollen; eyes prominent.

*January 15th, 1914.*—Is twenty months old. Examination made while asleep: heart beat, 56; heart enlarged, impulse in nipple line, fifth interspace, soft systolic murmur. Liver 1½ in. below costal margin. Eyes bulging, pupils



large. Fontanelle open. Respiration, 60. Grunts with each expiration. Recently has suffered with a cough. Chest clear; very constipated; walks and talks.

*March 12th, 1914.*—Has had no fainting attacks; looks better. Had something like mumps two weeks ago. Appetite and sleep good; liver still large; pulse 60. Slight cyanosis. Veins less prominent on the face.

*September 19th, 1914.*—Looks good. Eyes less prominent. Has been taking extract of bone-marrow for two months. Liver still enlarged. Weight 19 lb. 15 oz. Has had no attacks of diarrhea this summer. Not so constipated. Height 31¼ in. Pulse-rate, 58. Heart about the same.

It is impossible to make an anatomical diagnosis in this case. The condition is evidently some congenital malformation. The writer has been unable to find a description of a similar case.

CASE II.—F. McL., girl, *æt.* three, has been suffering from paroxysmal tachycardia. Suffering for eight months with recurrent attacks of prostration. The first occurred eight months ago without assignable cause, unless a gripal bronchitis, which she had a short time before, might be considered. She has always been a healthy baby, except that she had a severe diarrhea one year ago. Mother is a strong healthy woman; the father has been treated for some nervous trouble. The attacks last about two weeks. Meanwhile she lies prostrated, eats very little, vomits occasionally, breathes rapidly and sometimes coughs.

The writer saw her first in August, 1912, in her fourth attack. At that time her pulse-rate was over 200.

She had another attack in November, 1912. She came under the writer's observation when the disturbance had lasted ten days. She suffered with a paroxysmal cough. Has vomited several times. She objects to being moved and seems much prostrated. Skin pale, but otherwise looks well. Her appetite is moderate; no fever. The face was swollen and the eyelids puffy. The body had a slight edematous appearance. Respiration, 72; pulse over 200 per minute. Chest clear, with the exception of an occasional sibilant râle. Liver slightly swollen.

The patient was seen again on November 8th. Mother reported that she had a prolapse of the rectum the day before. This accident had occurred three times during the summer. Still coughs a great deal. Very much prostrated. Pulse over 200, respiration 70. She slept very well through the night, and ate a good breakfast. Temperature normal. Blood examination: leucocytes, 18,000, erythrocytes, 4,800,000. Nothing unusual in the blood picture. A specimen of urine obtained had a specific gravity of 1010, contained a trace of albumin and hyaline casts.

On November 11th, the patient felt much better, respiration 70, pulse 126. The swelling of the face and liver was disappearing. On the following day the breathing had become better (56 per minute). A few months later she had another attack, but the writer did not see her then.

Several drugs were tried to modify the rapid heart action. Belladonna, adrenalin, bromides, digitalis, all failed to make any impression on the cardiac disturbance. Small doses of arsenic were given in the interval.

This is probably the youngest child with paroxysmal tachycardia reported. The case of Robert Hutchison (*British Journ. Children's Diseases*, January, 1914, p. 241) was two and three-quarters years of age.

The long duration of each attack is also unusual.

1460 S. Grand Avenue.

## SPECIAL ARTICLE.

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### CHAMBERLEN AND MAURICEAU: AN UNSUCCESSFUL FORCEPS APPLICATION IN THE YEAR 1670.

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By FRED J. TAUSSIG, M. D., of St. Louis.

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While it is generally known that forceps were first employed for the extraction of the child in difficult confinements by an English physician called Chamberlen about 1600 A. D., and that he and his descendants kept this instrument a secret for over a hundred years, nevertheless the account given by Mauriceau of the visit of the grandnephew of the original Chamberlen to Paris and the unsuccessful application of the forceps made there by him is so entertaining that it deserves translation into English for the benefit of the present generation. The case upon which Chamberlen used his instruments is recorded as Observation No. 26 in Mauriceau's book on "Clinical Observations."

*Observation No. 26.—Concerning a woman who died with her child in her abdomen, after an English doctor had tried in vain to extract it.*

On the 19th of August, 1670, I was called to see a woman thirty-eight years old, of small stature, who had been in labor with this, her first child, for eight days, the membranes having ruptured on the first day of her labor with, however, practically no dilatation of the cervix. There being no change in her condition for four days, her midwife came to me for my opinion in the matter. I advised that she be bled, and in case this did not bring about the desired result, to have her take an infusion of two drams of senna in order to stimulate her pains. This was done on the following day with moderate success, for pains progressed sufficient to cause complete dilatation of the cervix. Nevertheless, in spite of this she could make no further progress, and the child, which lay with the vertex down but the face presenting, remained always in the same position without being able to enter the pelvis. The birth canal of this woman, who was very small, was so narrow and the bones forming it so tight and close one to the other, and the sacrum pushed so far inward, that it was absolutely impossible for me to introduce my hand which is unusually small, in order to confine her

when I was sent for to assist her three days after my first consultation. Having tried again and again, I could not succeed. Only by a special effort was I able to introduce my hand, and having introduced it, it was squeezed so tightly that all I could do was to move my finger-tips. I could not even introduce a blunt hook with accuracy in order to pull out the child, which to all appearances had been dead for about four days. Whereupon I declared the impossibility of delivery to all my assistants, who were of the same opinion and begged me to extract the child from the abdomen by the Cesarean operation. This I was unwilling to undertake, knowing that it was always very certainly fatal to the mother.

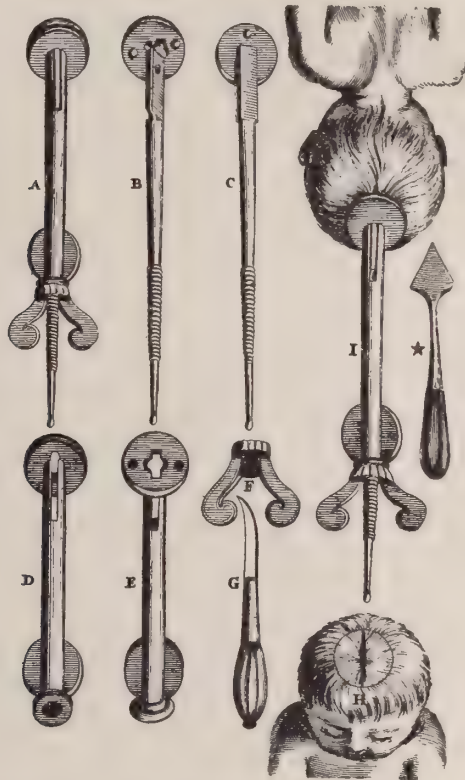
After I had left this woman in this condition, it being impossible for me to help her as I would have some other one whose body was more normally formed, it chanced that there was in Paris at this time an English doctor named Chamberlen, of a family which had from father to son made a profession of midwifery in England in the city of London, and who had acquired for some time a good reputation for skill in this branch. This doctor, having heard that I was unable to confine her, and seeing the condition she was in, expressed great astonishment that I was unable to bring it to a successful termination; I who had the reputation of being the cleverest man in my profession in Paris. In spite of this he promised positively to deliver her in less than ten minutes, no matter what difficulties he might find. Whereupon he set to work, and in place of ten minutes he worked for more than three hours without stopping longer than to take breath.

Then, having exhausted vainly all his strength, as well as his patience, and seeing that the poor woman was about to die on his hands, he was compelled to give up and confess that it was impossible to accomplish what he had claimed. This poor woman died with her child in her abdomen twenty-four hours after the extreme violence which he had employed. Through the opening which I made in her body, in doing after her death the Cesarean operation, which, as I stated, I did not care to do while she was alive, I found the child and everything else just as I had specified, but the uterus all torn and pierced in several places by the instruments which this doctor had employed blindly under the guidance of his hand, which, as it was larger than my hand by one half, could not really have been introduced far enough to be of much use.

Nevertheless, this doctor had come from England to Paris six months ago hoping to make a fortune and spreading the rumor that he had a remarkable secret remedy for confinements of this sort, claiming to deliver even the most desperate and hopeless cases in less than ten minutes, and he had even proposed to Monsieur, his Majesty's physician, that on receipt of 10,000 écus recompense, he



would communicate his pretended secret. But the single experience with this unsuccessful confinement, disgusted him so with this country that he returned to England a few days later, acknowledging that there were in Paris more skilful gentlemen in the art of confinement than was he. But before leaving for London, he paid a visit to compliment me on my book on obstetrics which I had published two years before, and to state that he had never found an operation so difficult as the confinement of this woman, praising



Mauriceau's Tire-tête. After perforation of the head, the disc of obturator B is slipped inside the cranium. The disc of tube D lies outside of the cranium and this tube passed over the obturator is fastened by the screw F. The bones being caught between the two discs, traction can be used on the head.

me for not having attempted it as rashly as he had done. I took his praise in the right manner, making him understand that he was mistaken in believing that the women of Paris were confined as easily as those of London. He left the next day, taking with him a copy of my book which he translated into English and published in 1672. After this translation he acquired so much fame as an accoucheur in the city of London that he made £30,000 and still is

making money according to reports. If some day he reads this observation, when I have published it, and if he is as sincere as I am, he will acknowledge that I have reported it exactly as it occurred. The extraordinary difficulty I met in this case induced me to invent an instrument which I have called *tire-tête* (pull the head), whose usage is easier and more secure than the hooks. If I had had that instrument at this time, I am sure that with its help I could have saved the life of that woman.

# MEDICAL AND SURGICAL PROGRESS.

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## A REVIEW OF THE SALVARSAN THERAPY IN NERVOUS AND MENTAL DISEASES.

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### A REVIEW OF RECENT LITERATURE.

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By SIDNEY I. SCHWAB, M. D., of the Editorial Staff.

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1. Meyer: The Position of Progressive Paralysis (and Tabes) to Syphilis and the Question of Treatment. (*Berl. klin. Wochenschr.*, No. 21, 1914.)
2. Spooner: The Treatment of Syphilitic Diseases of the Nervous System by Intravenous Injections of Salvarsan. (*Boston Med. and Surg. Journ.*, March 26th, 1914.)
3. Eskuchen: The Treatment of Syphilis of the Nervous System According to Swift and Ellis. (*Boston Med. and Surg. Journ.*, March 26th, 1914.)
4. Meyerson: Results of the Swift-Ellis Intradural Method of Treatment in General Paralysis. (*Boston Med. and Surg. Journ.*, May 7th, 1914.)
5. Ayer: Salvarsanized Serum (Swift-Ellis Treatment) in Syphilitic Diseases of the Central Nervous System. (*Boston Med. and Surg. Journ.*, March 26th, 1914.)
6. Gradwohl: The Treatment of Syphilis of the Nervous System by Means of Salvarsanized Serum *in vivo*—Ninety-one Injections in Twenty Cases. (*Lancet-Clinic*, July 1st, 1914.)
7. Berger: Neosalvarsan and the Central Nervous System. (*Zeitschr. fuer die Ges. Neurologie und Psych.*, No. 23, p. 344, 1914.)
8. Rivaut: Intra-arachnoidal Injection of Neosalvarsan in the Treatment of Nervous Syphilis. (*Semaine Méd.*, No. 33, p. 597, 1913.)
9. Maire and Levaditi: Intra-arachnoidal Treatment of General Paralysis with Salvarsan. (*Semaine Méd.*, No. 33, page 584, 1913.)
10. Sichard: Craniocentesis and the Subarachnoid Injection of Salvarsan in the Brain. (*Semaine Méd.*, No. 33, p. 662, 1913.)
11. Wile: Technique of the Intradural Injection of Neosalvarsan in Syphilis of the Nervous System. (*Journ. Amer. Med. Assoc.*, July 11th, 1914.)
12. Campbell: The Treatment of Syphilis of the Nervous System by Intrathecal Injections. (*British Med. Journ.*, No. 27, p. 76, 1914.)



13. Zeissl: Remarks on the Pathology of Syphilis and the Effect of Salvarsan. (*Berl. klin. Wochenschr.*, No. 51, p. 433, 1914.)
14. Citron: The Progress of Syphilis Therapy. (*Berl. klin. Wochenschr.*, No. 13, 1914.)
15. Wechselmann (*Berl. klin. Wochenschr.*, No. 12, 1914.)

There is at the present time almost as much difference of opinion in regard to the value of salvarsan in the treatment of syphilis of the nervous system as there was immediately following Ehrlich's discovery of 606.

The stage of temperate and logical criticism of results has evidently not as yet been reached. It might be of value, therefore, to review some of the recent work in order to see just what the drift of current opinion is and upon what data either the temperate or intemperate attitude rests. It should be pointed out that the defect of most of the therapeutic papers which are here selected, and which represent the average run of articles found both in the general and special journals, lies in a curious lack of scientific attitude towards a problem which everyone admits is by no means solved. There is a tendency to hasty conclusions which are backed up by personally tinged arguments either for or against the use of the remedy. For some reason or other articles on therapeusis still seem to smack of a kind of medical propaganda and one regrets to say of a little self-glorification. It is proper, therefore, for writers of such articles to guard against hasty deductions, to be sure of their clinical and laboratory facts, and to base their conclusions solely upon them. It is to be much regretted that many of these papers contain deductions which are largely personal opinions and are supposed to carry weight frequently where that opinion is of no particular neurological importance. A rather strange commentary is that a great many of these papers are written by men whose capacity to form neurological conclusions is much to be doubted. Dermatologists, gynecologists, general practitioners, surgeons, and others whose acquaintance with the finer methods of diagnosis must have been obtained very recently, write with an authority entirely unwarranted either by their training in or knowledge of syphilis of the nervous system.

It is obvious that the diagnosis of cerebrospinal syphilis is just as easy or just as difficult as it was before salvarsan and its modifications were discovered. It is reasonable to suppose also that the treatment of the tabetic or paretic is just as difficult as it was before. It is likewise just to conclude that the improvement which is so frequently set down in these papers is subject to the same variation that it always was; that an acquaintance with the whole problem of the tabetic, paretic, and syphilitic is just as essential for conclusions, as to the efficacy of a treatment, as it was before. The mere fact that an author is treating any of these diseases does not make him capable either of diagnosing it or coming to any conclusion so far as the efficacy of the treatment is concerned.

In this review a number of papers will be abstracted, showing the varying attitudes of their authors.

Among the more critical articles, Meyer's may be pointed out, particularly as it states the problem clearly and indicates how far from the truth the ever-optimistic data of the usual clinical article

appear to be. He does not believe that Noguchi's discovery of the presence of spirochetes in the cortex of paralytics need change our conception of paresis in the least, nor does he believe that their presence there constitutes any positive warrant as to the conclusion of the efficacy of the salvarsan therapy for that particular disease. He calls attention to the fact that paresis is marked clinically by two positive facts: First, a progressive dementia, and then a fatal termination. Neither of these well-established facts bears any relation to the existence of a cerebrospinal syphilis, which Noguchi's findings would at first sight link together. There are two things which tend to separate them, first, the long interval of time between the initial lesion and the development of parietic symptoms, and secondly, the difference in pathological lesions which are found in paresis and cerebrospinal syphilis. Add to this the difference in the therapeutic reaction to antisyphilitic measures of the two diseases, and the conclusion is admissible, therefore, that they are not different stages of the same disease, but that there exists some marked differentiating quality which we do not at present understand.

Following this kind of reasoning it seems fair to conclude that paresis is not a kind of cortical syphilosis at all, but is something entirely different, standing apart and independent. This holds equally true of tabes. In respect to salvarsan and its various modifications, an identical conclusion appears justifiable. With the exception perhaps of some cases of tabes which have shown beneficial effects of salvarsan, the results in paresis are extremely questionable.

Meyer leaves untouched the Swift-Ellis procedure, as the evidence is not yet available. The conclusion of this very critical article is that there is a possibility of favorably influencing paresis and tabes, but that it is only by means of carefully selected cases and under the strictest conditions of control and observation that success will ever be attained.

There are two important variations of the original salvarsan method which form the subjects of most papers: the intraspinal injection of salvarsanized serum into the spinal canal, and the direct injection of salvarsan into the canal. By far the larger number of papers up to a very recent period have treated of the effect of intravenous salvarsan in the treatment of tabes, paresis, and cerebrospinal syphilis.

Spooner gives a very careful study of the effects of intravenous salvarsan in 91 cases. This article is one of the best examples of the careful study of cases, and meets the demand of conscientious work as heretofore outlined.

The cases have been followed for about three years, have been carefully observed, and the necessary laboratory data carefully arrived at and tabulated. A few brief clinical résumés have been given to illustrate definite points. In reading this paper one feels that the author had no particular object in view except the publication of results which his data seem to justify. Some of his conclusions are as follow:—

It is possible to treat in a satisfactory manner syphilitic diseases of the central nervous system by intravenous salvarsan in an ambulatory clinic.

Small doses of the drug are necessary for this purpose, but such dosage yields results.

With the exception of the 6 cases placed subsequently on serum treatment, and excluded from this paper, symptomatic improvement has resulted from thorough treatment in a high percentage of cases of tabes and in all cases of syphilis of the central nervous system. No distinct improvement has resulted from treatment of the few cases of general paresis under observation.

Improvement in strength and gain in weight is the rule in those who receive benefit. The relief of lancinating pains in tabes, and headache in cerebral syphilis is most striking.

Biological and cytological changes (in blood and spinal fluid) indicate that there is an organic basis to this symptomatic improvement. It is regrettable that those observations were of necessity so limited.

Improvement has been maintained over a long period of time—in many instances for from one to two years. The results of laboratory investigation when obtainable and the amelioration of symptoms correspond.

Whereas the failures have been in old-standing cases, it is impossible to show any constant relationship between the degree of improvement and the duration of the nervous lesion.

The most pronounced successes are in those who show evidence in blood or spinal fluid of intense syphilitic infection. The failures have occurred in those showing feeble reactions.

This treatment might well be advised in all cases of syphilitic disease of the central nervous system, and abandoned for the serum treatment when conscientious effort in this simple and safe procedure has failed.

By far the larger number of articles that have appeared in the last year have to do with the Swift-Ellis procedure; that is, the introduction of salvarsanized serum into the spinal canal. The report from these papers is very unsatisfactory, as an insufficient time has elapsed to test their curative value. A few selected from these papers might tend to show in a general way some of the results that have been obtained.

Eskuchen reports on 16 cases of tabes, 2 cerebrospinal syphilis, and 5 cases of paresis. They were given in all 68 injections. In almost all these cases pleocytosis was either diminished or disappeared. The same could be said of the globulin reaction. The Wassermann reaction on the other hand was much more stubborn. In many cases it remained undisturbed and in others was slightly diminished. In none of these cases was the Gold-lonage influence at all affected. In many cases the subjective discomfort in tabetics was improved or disappeared altogether. In one case a very severe grade of ataxia improved. On the other hand, none of the objective symptoms was at all affected, but the disease on the other hand could in no case be said to have grown worse. The conclusion arrived at by the author is that this method of treatment does not influence at all any of the objective tabetic symptoms; that the subjective disturbances can be improved and in some cases the disease apparently brought to a standstill.

Meyerson reports on a series of 8 cases of paretics with carefully worked out serum and laboratory tests, and fairly complete clinical summaries. This paper is really of some value, although its ver-



bosity is a bit disturbing to the seeker after facts. The conclusions set down are rather extreme in comparison to the majority of papers of this sort, implying a very much more critical attitude on the part of the writer. He emphasizes particularly that what is changed by this form of treatment is the Wassermann reaction. However, this is shown to be variable whichever form of treatment may be used. He concludes that no clinical improvement can be recorded that cannot otherwise be accounted for. He calls attention to the fact that the decrease in cell counts may often be a temporary phenomena. This, by the way, has been observed a number of times, but has not been given the emphasis that it deserves. Another of the conclusions which is of interest is that the Wassermann reaction probably is not nearly so important a criterion of improvement or recovery as it has frequently been held to be. The author says a great deal upon the theoretical objection to the Swift-Ellis procedure, attempting to show that it is illogical because the paretic lesions are located very deeply in the cortex, and the organisms are found entirely in the cortex substance itself. This would be a very interesting objection if it could be positively shown that cerebrospinal fluid does not reach the deeper lying tissues. He calls attention, and very wisely, to the fact that paresis is not due to the presence of the spirochete in the cortex of the brain, but that the degeneration which follows bears only an indirect relation to its initiatory cause. In other words, it is conceivable that in the paretic all the organisms could be removed from the body without affecting the progress of the disease at all. The author advises, however, further trial of this method in selected groups of cases.

This article might be commented upon and praised largely for the critical position its author assumes towards the subject, and suggests likewise that in all therapeutic articles the more such a position is taken the more value lies in the conclusions which are advanced.

Ayer reports on 18 cases representing a variety of types of syphilis of the nervous system, more or less refractory to other treatment. Of these, 14 were distinctly improved, 1 unchanged, and 3 continue unchanged.

The following conclusions are advanced by the author:—

The method is safe.

It is effective in many cases where other treatment has failed.

It undoubtedly attacks syphilis from the etiological point of view, thus tending to cure the disease as well as relieve symptoms.

Its greatest effect is in the group of cerebrospinal syphilis, in which a cure may confidently be looked for in some cases with persistent treatment; second, in tabes, in which arrest of disease process is often possible by this means; least effective in general paresis, when well developed, though here if taken in the preparetic stage encouraging results may be obtained.

With the originators of the method, we agree that persistence in its use is the keynote to success in the use of salvarsanized serum; consequently an estimate from the injection of one or two doses is a judgment more of the 'reaction' which in some cases is severe, than of the therapeutic effect of the serum.

With the technique of administration and necessary control, examinations as laborious as at present, we do not expect to see this form of treatment in general use, but believe it should be em-

ployed by those especially trained when other treatment fails in whole or in part, or in cases where haste is required in order to save vital tissue.

A paper by Gradwohl is here quoted simply as an example of the kind of paper which should be received with scepticism. It is to be noted here that its author is in no sense a neurologist, an internist, or a dermatologist, but is chiefly a laboratory worker. It is to be feared that the impression of such a paper, written uncritically and uninformed, might have more influence than is warranted. The paper is based upon material from 20 cases. The diagnosis of tabes or paresis or taboparesis is based upon the most flimsy and incomplete examination. The assumption that every case that has an absence of knee-jerks and what the author calls 'areas of anesthesia' and fixed pupils, are cases of tabes, and that paresis is diagnosed by what the author calls 'mental confusion' should be evidence enough of the utter untrustworthiness of the author's clinical acumen.

Some of the author's conclusions are open to serious question. Apparently losing sight of the fact that the change in the Wassermann reaction is frequently only temporary, and is sometimes produced by other methods of treatment, the author asserts that with our previous method of treatment this was rarely, if ever, true. This is so evident an unwarranted statement and so manifest a desire to bolster up the Swift-Ellis treatment for purposes quite foreign to a scientific study of therapeutic efforts, that it need only be mentioned here to be condemned. He speaks of clinical improvement in paresis as a result of this treatment, a thing that no one of recognized standing in the use of this treatment has as yet asserted.

A protest against this paper, and particularly against this kind of paper is made here for the reason that when a more complete statistical study of these studies is made these records of Gradwohl are sure to be included, and as the chances are that these records will increase in further publications of this author, the damage done to the proper understanding of the question can easily be appreciated. Berger has made some animal experiments to solve the question of the injury which salvarsan or neosalvarsan caused by direct injection into the central nervous system. He found that doses up to 0.001 grm. proved fatal and that even doses of 0.005 caused very definite local changes in the tissues. It is only when dilutions from one to ten thousand are given that the local changes disappear. Therefore, he concludes that salvarsan doses larger than the above ought not to be given, and he explains the severe symptoms in cases of tabetics and paretics which Maresco found on this basis.

In spite of repeated experiences concerning the danger of direct injection of salvarsan into the spinal canal, a number of papers have appeared. The most enthusiastic advocate of this method is Rivaut. He reports upon 9 cases of syphilis of the nervous system which were treated with intraspinal injections of salvarsan. 0.6 grm. neosalvarsan was dissolved in 10 c.cm. distilled water, and of this solution 1 to 4 drops, which is equivalent to 3 to 12 mgrm. neosalvarsan, were injected into the cerebrospinal canal together with cerebrospinal fluid which had been taken out. The injections were repeated every eight days and six of them were given. No reaction phenomena were observed.



At the same time an intravenous salvarsan treatment was carried out. It is reported that the result was good in 5 cases (2 cases of secondary syphilitic meningitis, 2 tabes, and 1 case of recent progressive paralysis); one case of clinical myelitis acted very well and in the other cases the result was indefinite. Together with improvement of the clinical symptoms the cerebrospinal fluid showed changes which corresponded.

Maire and Levaditi report on 16 cases of progressive paralysis which were treated by intraspinal injection of from 1 to 6 cgrm. neosalvarsan. In 8 of these cases improvement resulted, in 6 others the disease was unaffected.

Sichard found some improvement in a case of progressive paralysis by injecting small doses of neosalvarsan under the pia-arachnoid of the brain.

Wile continues his account of experiences in the intradural injection of neosalvarsan. The solution used for injection consists of a 6 per cent. solution of neosalvarsan in distilled water. This solution is hypertonic and made of such a concentration that each minim contains 3 mgrm. The dose injected is from 3 to 12 mgrm., that is, from 1 to 4 drops of the solution. Fifteen different patients formed the material of these experiences. Of these, 7 were tabes dorsalis, 3 general paresis, and 3 cerebrospinal, and 2 taboparesis. The histories of these cases are given in some detail. The results are as follows: Of the 15 patients treated 2 died; 7 cases showed marked improvement, both subjectively and in the objective findings in the cerebrospinal fluid; 3 patients with paresis were given only one injection and showed no improvement; 1 patient showed an improvement after a single injection.

Nothing but tentative conclusions can be drawn from these results. It is apparent to me from my experience that in general, cases, with cerebrospinal syphilis other than tabes or paresis, have done decidedly better than those in which either one or both of these two conditions have been present. It is noteworthy that those cases of tabes have done especially well in which no bladder or rectal symptoms were present. It would seem, therefore, that cases in which such symptoms were present constitute contraindications for the treatment as it is given at present. The marked improvement in the objective findings in the spinal fluid following treatment, in practically all forms of syphilis thus treated, even in the absence of subjective improvement, leads one to hope that this form of treatment is along the right line for checking or, indeed, in some cases, even curing central nervous involvement. I am led to believe that my earlier cases would have done better with injections even of smaller doses than those which were given. Subsequent injections will be given in small doses and diluted with a greater amount of the cerebrospinal fluid.

Cases to be thus treated should be carefully selected. For the present at least, this form of treatment should be restricted to those cases in which other forms of treatment have proved inefficient.

In all cases the danger of the treatment in its present unperfected state should be pointed out to the patient and his family, and the responsibility for its administration should be shared by them. It is to be hoped and expected that more careful study and selection of



cases will prove the intradural injection of neosalvarsan a potent remedy in combating cases of cerebrospinal syphilis.

Campbell recounts his experience in patients to whom he has given, in addition to mercury and neosalvarsan, intraspinal serum treatment in tabes, progressive paralysis, and cerebrospinal syphilis. Chiefly good results were obtained; the disappearance of the positive Wassermann reaction in the spinal fluid in 3 out of 5 cases; the disappearance of the globulin in 4 out of 5 cases; in 1 the decrease of ataxia and pain and increase in weight; and in 1 case the reappearance of an absent knee-jerk.

This latter is the only report found in the papers so far examined in which the reappearance of the absent knee-jerk is discovered. It must be accepted in this case as a trustworthy observation on account of the clinical experience of its author. It must be admitted, however, that an absent knee-jerk is frequently a very difficult thing to be absolutely sure of, and its reappearance may have been due to the fact that in the first instance no manœuvre that could be at that time devised could bring it into activity. At any rate it is well to consider and regard this with some scepticism.

Two papers might be quoted here on the general aspect of the salvarsan therapy apart from its special application to nervous diseases. Von Zeissl has treated a thousand syphilitics with salvarsan without seeing the slightest injury to the patient, although he admits that in the literature some reports to the contrary are found. He brings out the idea that in the very early period of syphilitic infection there has been found injury to the nervous system, and it is to such cases presumably that attention has been directed to account for the supposed bad effects of salvarsan on the nervous system.

Citron, in an article on the progress in the treatment of syphilis, gives a rather complete account of the various positions that have been taken in regard to salvarsan, and he calls attention particularly to Wechselmann's article in which he insists that syphilis should be treated purely by salvarsan. Wechselmann's material is based upon the experience of 45,000 injections. Wechselmann's conclusions from this material are that with a purely salvarsan therapy syphilis can be completely cured. Citron, however, believes that whatever the theoretical basis of Wechselmann's idea, so far as the patient is concerned better results are obtained by a mixture of mercury and salvarsan.

Citron mentions two contraindications for the treatment of salvarsan. One is diseased kidneys. In support of these he notes the fact that in 4 of these fatal cases, 3 had kidney disease of one kind or another. The contraindication is very important; that is, the ordinary minor infections. Patients with catarrh of the larynx or bronchitis should not be treated by salvarsan; likewise individuals who are in a convalescent period of pneumonia, grippe, diphtheria, etc. Tuberculosis, on the other hand, is not regarded by him as a contraindication.

This very interesting and suggestive article is concluded in this way: "Fear on account of salvarsan does not appear to be justified. The fear of the result of syphilis so far outweighs the remote dangers of salvarsan that it is not to be considered. The injuries which are seen by the clinician where cases are badly or inefficiently treated are very large. Death through valvular disease of the aorta,

tabes, paresis are common. Deaths from salvarsan he concludes are almost a myth of past ages."

It is difficult indeed to form any definite conclusion based upon the papers that are quoted in this abstract. The literature is so full of papers that these form but a small percentage of them. They have been selected simply because they represent types of the various kinds of articles that have been written in the last five or six months. It is easy to see that all of them give us no definite answer to the questions which are before us. To one question the answer seems fairly well admitted, and that is, that syphilis in its early stages is treated best at the present time by means of salvarsan and mercury. At just what point in the development of the syphilitic the nervous system may be affected is not at the present time completely understood. It seems reasonable to suppose that it is much earlier than is commonly believed. If this is so, then the well-treated case of primary syphilis should include in a certain percentage of cases an effective therapy towards the beginning attack of the central nervous system. Therefore, for the very earliest appearance of syphilis of the nervous system falling within the range of primary treatment of syphilis, salvarsan seems a potent and far-reaching remedy. Much beyond this period there is still a question as to whether salvarsan is of any great advantage over mercury. Certainly the experience with tabes and paresis would support this view.

It must not be forgotten that in cases of paresis or tabes, characteristic pathological defects upon which these diseases rest are only indirectly the result of the primary infection; syphilis of other organs, on the other hand, amenable to salvarsan therapy may be coincident. In this case then the salvarsan does not affect the tabetic or parietic process but the remnant of the primary infection of the syphilitic infection upon the general organism.

In analyzing critically the result of treatment in the latter cases with salvarsan, or salvarsanized serum, or direct salvarsan into the spinal canal, one is impressed that the result of the treatment is really to be interpreted from the point of view of the general improvement in the individual and is not due to the regeneration of nervous tissue, which is at the bottom of the tabetic or parietic changes. If this reasoning is found to be true, then we have reached the stage where we can specify with some degree of accuracy just what the treatment in the way of salvarsan might do for tabetics and parietics. It is only by the positive analysis of large material, which up to the present time has been lacking, that it will be possible to obtain a clear-cut notion of this very important point.

In summing up the large material for this purpose, statistics should not be admitted until they come from an experience which is shown to be clinically worthy of respect. It is probable, therefore, that combined statistics will not serve the purpose for the proper estimation of the value of salvarsan until the whole statistical material comes from one clinic and from the hands of some individual who is properly qualified from a clinical and laboratory point of view. The question, therefore, is still unsettled and seems likely to remain so for some time.

## CEREBRAL ROENTGENOLOGY.

## A REVIEW OF RECENT LITERATURE.

By E. H. SKINNER, M. D., of the Editorial Staff.

1. Brown (*Boston Med. and Surg. Journ.*, Vol. CLXVIII, No. 24, p. 882).
2. Cooper (*Cal. State Journ. Med.*, No. 6, 1912).
3. Cushing: *The Pituitary and Its Disorders*. Philadelphia. 1912.
4. Fitzgerald (*Journ. Anat. and Physiol.*, p. 44, 1910).
5. Jaugeas: *Précis de Radiodiagnostic*. Masson et Cie. Paris. 1913. *Les Rayons de Roentgen dans le diagnostic et traitement des tumeurs hypophysaires, etc.* Steinheil. Paris. 1909.
6. Johnston (*Amer. Journ. Roentgen.*, N. S., Vol. I, No. 4, p. 472).
7. Luger (*Journ. Amer. Med. Assoc.*, Vol. LXI, p. 752).
8. Manges (*Amer. Journ. Roentgen.*, N. S., Vol. I, No. 10, p. 361).
9. Schueller: *Roentgendiagnostik der Erkrankungen des Kopfes*. Hoelder. Wien. 1912.
10. Schueller (*Lancet*, Vol. II, p. 1251, 1909; *Wien. med. Wochenschr.*, No. 10, 1908).
11. Stewart (*Amer. Journ. Roentgen.*, N. S., Vol. I, No. 2, p. 83).

The neurologist has made little demand upon the roentgenologist until quite recently. Of course, the determination of the extent and character of skull fractures has been quite satisfactory for many years.

The introduction of stereoscopic roentgen exposures has added materially to the correct interpretation of skull fractures, especially depression fractures of the inner table and fractures at the base. Experiments by Hickey have shown that it makes considerable difference in the shadows of the base when stereoscopic exposures are made by shifting the tube upon the occipitofrontal plane or upon the cervicobregmatic plane. For instance, if one desires information upon the sella turcica, it is better to shift the tube upon the occipitofrontal plane, but if details of the foramen magnum were desired it would be best to shift the tube upon the cervicobregmatic plane. The occipitofrontal stereoscopic shift is best for exposures of the mastoid area according to Hill, of Cleveland.

It may be successfully argued at the present time that stereoscopic exposures are essential to the correct estimation of the shadows at the base of the skull. One has only to view the lateral aspect of a skull with the fluoroscope to realize the extreme changes in the shadows of the sella turcica produced by the slightest rotation of the skull, either laterally or vertically. It is almost impos-



sible to make a single lateral exposure of the skull and know what relation there is between the parallel ray from the roentgen tube and the plane of the base of the sella turcica. It is true that Cushing and others content themselves with the single exposure; but they are usually seeking information as to the broadening or shallowing of the sellar cavity or the resorption of the clinoid processes from tumor pressure. The startling findings of Johnston in the sellar shadows of individuals developing epilepsy beyond the age of puberty and the ease with which similar shadows may be produced from normal skulls will make further demands for stereoscopy.

There is great importance to the roentgen shadows where pituitary disease is evident; particularly the roentgenography of the skull and sella turcica offers important data for differential diagnosis.

*The Pituitary Fossa.*—Brown relates that the conformation of the pituitary region (roentgenologically, the pituitary fossa) varies normally nearly to the degree that the accessory sinuses present such variation. The element of age in the normal individual does not make for such contrast, however. Whereas in early life the sphenoidal sinus may be roentgenographically uninterpretable, a recognizable contour of the pituitary fossa appears at term. In addition to this, the sella apparently approaches its mature conformation in early adolescence, which cannot be said of many of its neighbors in the cranial anatomic complex.

As roentgen evidence of pituitary disorder, Cushing classifies the deformed pituitary fossa into three types. He does not consider, however, that the presence of a normal-appearing sella, or rather a sella well within the classification of normal variation, necessarily indicates that hypophyseal changes are absent, whether or not other manifestations of the syndrome in question are present. This classification with succinctness obviates a prolonged discussion of the roentgenologic aspects of the situation:—

(1) A type in which the clinoid apophyses and the dorsum sellæ are generally thickened (allowing for the slight magnification of the roentgen projection).

(2) A type in which the same structures have undergone a diminution in shadow or thinning from the effect of pressure absorption.

(3) A type in which there is evidence of general destruction of the whole roentgen delineation of the pituitary fossa.

Cushing has also called attention to certain changes demonstrable by *x*-rays in the vicinity of the sella, as well as somewhat remote from it. But two of these, perhaps, may come within the scope of a consideration of the cranial base. One is the often enormously increased depth of the frontal sinus, seen in the hyperpituitary group. Another is the invasive effect of strumous degeneration of the hypophysis upon the intimate morphology of the sphenoidal sinuses. To Brown this possibility is of the greatest importance, since by it an entirely new phase is added to the roentgen pathology of the sphenoid.

That the sella turcica varies widely in its normal roentgen-portrayal may be inferred from its outlines shown in cases by no means of hypophyseal involvement. Measurements have been made by certain observers.

## MENSTRUAL LIMITATIONS OF THE PITUITARY FOSSA

(in Millimetres).

	LENGTH	BREADTH	DEPTH	MEASUREMENTS
Fitzgerald 1910	10-14.5	14-17.5	6.5-7.5	Cast measurements
Gibson ....1910	12 (av.)	13 (av.)	6 (av.)	In situ
Keith .....1911	10-12	14-15	8	In situ
Cushing ...1911	15 (nor. max.)		10 (nor. max.)	Radiographic

Writers who have demonstrated pictorially changes in the sella as a part of the objective symptom-complex of hyperpituitarism have called attention to the undue shadow-thickness of the clinoid apophyses and the dorsum as evidenced roentgenographically by the existence of a *double contour* of their peripheral outlines. This appearance, of course, results from the distortion of the shadow of that aspect of the fossa which is farther away from the roentgen plate, and, consequently, it is disproportionately superimposed upon the smaller shadow of the nearer sellar structures. While this appearance may well suggest an increase in breadth of the sella and by the same token a hyperplasia both of the floor and the dorsum sellæ, nevertheless, a similar double-line projection can be produced from a normal sella by faulty technique if the element of the distortion is not borne in mind. In other words, hyperplastic clinoid apophyses and dorsum sellæ will usually produce a double line projection of the sellar limitations in the lateral plane, but the presence of such double lines upon the roentgen plate does not, necessarily, mean the presence of hyperplasia. Possible confusion in this detail of interpretation can be obviated by careful technique.

Brown argues in favor of stereo-roentgenographic technique, not only with reference to the occipitofrontal plane, but also in the suboccipitobregmatic and in the cervicobregmatic planes as well.

Luger in discussing the normal size of the sella turcica grants that a measurement of 15 mm. anteroposterior and 10 mm. vertical diameter is considered to be the limit in size to which it may normally attain; but in considering the size of the sella it is necessary to take into account the condition of the other ductless glands, especially of the sexual organs, which are known to have a definite correlation with the pituitary gland. It is known that castration produces hyperplasia of the pituitary gland and secondary enlargement of the sella turcica (Tandler and Gross), as opposed to the findings in the so-called 'eunuchoid type,' in which no enlargement of the sella turcica has been observed, in spite of the many resemblances to the true eunuchs in their somatic appearance.

Concerning the female sexual organs, undoubted changes in the hypophysis during pregnancy have been observed, and enlargement of the sella turcica roentgenographically has also been reported; indeed, in older multiparous women we find rather often a comparatively large sella, a finding possibly due to ovarian insufficiency. One should be cautious in making a diagnosis of pituitary tumor in these persons in the absence of clinical tumor symptoms. It seems possible, however, that pituitary hyperplasia secondary to insufficiency of one of the remaining ductless glands could produce true acromegalic changes.



Furthermore, the condition of the thyroid gland must be taken into consideration, for, in many cases of myxedema, enlargement of the sella turcica can be demonstrated roentgenologically.

The two most common variations—the short and rather deep, and the long and rather flat types of sella—seem to be dependent in some way on the shape of the base of the skull (Schueller). The first type we find, as a rule, in brachycephalic persons, the second in those who are bradycephalic.

Another interesting correlation has been noted by Fitzgerald, who asserts that the size of the sella always corresponds to the length of the posterior portion of the skull, but that it is in indirect proportion to the distance from its anterior wall to the ethmoidal spine. Although we have as yet no certain knowledge concerning these things, we frequently find a small sella in association with a massive sphenoidal bone or with poorly developed sphenoidal cells, aside from the acromegalic cases in which the enlargement of the sinuses belongs to the characteristic syndrome.

In general, however, it may be said that conclusions in regard to disorders of the gland itself can be drawn only from the changes in the bony parts. These changes in the sella turcica are represented by its enlargement, by a thinning of the floor and by a thinning and absorption of more or less of the dorsum and of the posterior clinoid processes.

In tumors of the brain which have no topographic relation whatsoever to the pituitary gland and in the case of internal hydrocephalus, we find not infrequently changes due to the increase of intracranial pressure. In these cases the differential diagnosis can be made only from the clinical symptoms and the other roentgen-ray findings in the skull, for tumors of the hypophysis in their early stage only exceptionally show signs of increased intracranial pressure on the roentgenogram. Tumors of the brain, on the other hand, often produce even at this time an enlargement of the diploëtic veins and deepening of the Pacchionian grooves and of the furrows corresponding to the convolutions of the brain. The differential diagnosis can often be made by the secondary changes of the skull and by a lack of the typical acromegalic changes, such as a thickening of the bone, enlargement of the sinuses, mandibular prognathism, etc.

Special attention should be called, according to Schueller, to the development of the so-called sphenoparietal sinus—a venous channel connecting the sinus cavernosus with the convexity of the skull. In big tumors of the sella this sinus is often enlarged, which can be explained by pressure of the growth on the sinus cavernosus. In normal persons, however, one must always remember that a large sphenoparietal sinus is occasionally to be found; so that this condition must always be interpreted with a certain amount of caution.

The foregoing information goes to show that changes of the sella turcica in size and shape occur rather frequently in conditions other than true pituitary tumors; that is, in tumors in the neighborhood of the sella turcica as well as in tumors without any topographic relationship to the hypophysis and in cases of increased intracranial pressure due to internal hydrocephalus. On the other hand, the great influence of the other ductless glands on the development of the pituitary gland and on the secondary changes of the sella turcica has been demonstrated. These facts prove that not every



change in the sella turcica is necessarily to be interpreted as a result of a primary pituitary disease.

*Roentgentherapy.*—Jaugeas presented arguments favoring the roentgentherapy of hypophyseal tumors in a thesis published in 1909. Favorable case reports by Gramegma and Bécère are included in the above publication. Jaugeas bases his argument upon the observations of Heinke, Bergonié and others, that the roentgen ray causes a recession of glandular activity and function. This action has been of therapeutic importance in hyperthyroidism as witnessed by innumerable authoritative case reports. Since Jaugeas' report, however, there have not been many, if any, additional reports favoring the roentgen therapeutic attack of pituitary tumors; rather have the reports been decisively surgical (Cushing and others).

*Acromegaly.*—Cooper supplies a good description. The facial features exhibited by patients with this disease, the large spade-like hands with their padded eminences and sausage-shaped fingers, or maybe the elongated well-formed giant hands, the massive and long oval-shaped face with its large nose, thick lips, accentuated supraorbital ridges, prominent malar bones and projecting lower jaw, the enormous feet and the cervicodorsal kyphosis are classical.

An association between this condition and a diseased hypophysis was soon noted, though for a long time it was surmised that it depended upon a suppressed function of the gland. To-day, though it has been impossible to produce experimentally sufficient hyperfunction of the gland to give rise to the clinical features of the disease, yet the feeding experiments of Shaefer, the experimental work of Cushing, the post-mortem examination of the gland in patients who have died whilst suffering from the disease, and above all the regression of symptoms speedily following partial removal of the diseased structure, strongly suggest that acromegaly is directly associated with hypersecretion of the anterior lobe of the hypophysis.

Cooper's radiographic technique is as follows:—

1. A point upon the orbito-auditory line 50 mm. from its anterior end is marked.
2. The head of the patient is so placed upon the plate that its sagittal plane is parallel to the sagittal plane of the plate.
3. The tube target, at a distance of 50 cm. from the plate, is centered over the point marked.

The vertical incident ray under these conditions will pass through the center of the floor of the fossa, and distortion effects are minimal.

The fossa itself is, of course, at some distance from the x-ray plate, a distance varying with the width of the patient's skull; consequently each turn of the head on its vertical axis, and each tilting on its transverse axis alters considerably the picture of the cavity, and so it is very important to obtain as true parallelism as possible of the head and plate.

Large variations in the direction of the incident perpendicular ray will produce similar effects, and Krause frankly states that in a not inconsiderable number of cases he has assumed widening of the sella turcica when autopsy revealed the contrary.

In some plates shadows of increased density due to elevated bony bosses on the inner skull table appear within the cavity of the fossa. They must not be mistaken for concretions.

In addition to an abnormal fossa outline the radiogram of the acromegalic skull exhibits irregularity of the cranial parietes, enlarged frontal and maxillary fossæ, and exaggerated post-lambdoidal prominence, and an enlarged prognathous jaw.

*Brain Tumors.*—Schueller has probably given us the best information upon the localization of brain tumors by roentgen shadows. It is possible to obtain direct shadows of brain tumors when there is some calcification within the tumor mass; another possible shadow of a soft-tissue tumor occurs when it encroaches upon an air-containing accessory sinus. It is, however, not necessary to limit the roentgenography of brain tumors to this small field, because brain tumors may produce characteristic changes in the bones of the skull of a destructive nature. One can differentiate between local and diffuse bone destruction. Brain tumors exert their greatest influence upon the inner table of the skull and upon the normal integrity of the base of the skull, particularly of the sella turcica.

Another detailed characteristic of the intracranial pressure is in the shadows of the diploëic veins. General intracranial pressure produces the characteristic wavy shadows of the inner table known as *compressioni digiti* and corresponding to the convolutions of the brain. Localized intracranial pressure produces an increase in the size and number of diploëic vein shadows in that portion of the skull adjacent to the tumor mass. There may even be actual localized destruction of bone in the vicinity of the tumor, especially in hypophyseal tumors. Schueller says that if a tumor of the brain contained salts of lime, its shadow might be visible on the screen or plate, but that this was comparatively infrequent. More assistance in this respect might be obtained from certain secondary changes produced by the neoplasm—namely, (1) the destruction of the osseous wall of the skull, either local or general; (2) the dilatation of the venous channels of the diploë, which become so marked that they possess a diagnostic value; (3) the increased distinctness of the sutures; and (4) the very characteristic increase of the thickness of the skull. This thickening was due either to concentric hyperostosis of the walls, or to long excrescences on the inside of the skull. Sometimes the shape of the skull was changed by the new growth. Schueller said that he had examined 240 cases and has succeeded in making a positive diagnosis in 150 of them; it was remarkable that amongst the 150 positive cases there were 54 with involvement of the hypophysis. He therefore considered that *x-ray* examination of cases of intracranial mischief was indispensable.

*Cerebral Ventricles.*—Stewart reports a case where lateral skull roentgenograms indicated air in the cerebral ventricles. There was a fracture of the vertical plate of the frontal bone in the region of the outer edge of the right frontal sinus. Upon the lateral roentgen negative there was a peculiar dark circular shadow just behind the fracture. From the posterior portion of this shadow a wide area extended backward, curving downward to the posterior border of the mastoid cells, then turning sharply on itself and narrowing, extended forward and terminated in the region of the sphenoidal cells. In the frontal view, taken with the head sharply flexed, dark shadows appeared, which were oblong in shape, dark and small, rather high up with radiating branches downward and to each side like an arch. A small circular shadow appeared lying below and between the downward arms. From the shape, location and course



of these shadows, their varying density and character simulating gas in the intestines, Stewart was led to conclude that there was a fracture of the skull complicated by cerebral ventricles distended with air or gas. This roentgen finding was corroborated at the autopsy. It was subsequently learned that a severe pain in the head, with a free discharge of clear fluid from the nose, followed a violent blowing of the nose. The logical conclusion was that the patient had established a communication between the nose through the right frontal sinus and anterior lobe of the brain into the right lateral ventricle, and that when he blew his nose that he also blew up the ventricle of the brain.

A somewhat similar case was reported by Pfahler in his discussion of Stewart's paper.

*Epilepsy.*—Johnston was stimulated to the examination of the pituitary region in every case of epilepsy obtainable, especially those in which no symptoms of pressure in the region of the pituitary were present, as evidenced by changes in the eye-ground or visual field.

Decided departures from previous conceptions of the normal in the topography in the sella turcica were observed in a class of patients with an uneventful history—no injury, the ordinary children's diseases, previous good health, some time between the ages of fifteen to thirty-five attacks of petit mal, gradually increasing in severity and frequency.

These changes were but rarely found in the type of chronic epileptics, but were found with a regularity that gave rise to intense interest in the class of cases just described. These changes are appreciated only when one has familiarized himself with the ordinary appearance of the pituitary fossa in a normal individual through the examination of a number of laterals of the head made for purposes other than the examination of the pituitary itself. The changes consisted, for the most part, in an overgrowth of the anterior and especially the posterior clinoidal processes, which in addition to an increase in area and length are slowly folded over and down upon the pituitary gland, enclosing it within a bony basket. The fossa is thus largely or completely roofed over in some cases; illustrations show that the anterior and posterior clinoidal processes not only meet but overlap. At first Johnston was inclined to look upon this change as a mere interesting anatomical deviation, but when it reached the point where he was able almost to prophesy, from the history of the patient and a physical examination, the practical degrees of roofing to be expected in a given case, he was forced to attach some importance to this abnormality.

In addition to this overgrowth of the clinoidal processes, a large proportion of the cases show distinct increase in density in the bony tissues forming the roof of the orbits, the sphenoidal sinus, and the ethmoidal cells. In quite a number of cases the sphenoidal cells are decidedly blocked with newly formed bony tissues. Johnston terms this a localized acromegaly.

Johnston continues that it is thus seen that the pituitary gland, owing to its peculiar location, may be encroached upon to a considerable degree by any hyperoptosis of the posterior or middle clinoidal processes; and it is his belief that the deviations here to be shown, whether they are to be considered anatomical deviations



or as a more or less rapid bone deposit due to an inflammation or to a local acromegaly, may cause a hypophyseal condition of which the epileptiform attacks are merely the symptoms. He quotes Cushing extensively in regard to the possible relation of hypophyseal insufficiency to epilepsy.

It is very easy to reproduce shadows in normal skulls similar to those presented by Johnston in his article, by simple rotation of the skull laterally or vertically. Every roentgen means including stereoscopy should therefore be employed to eliminate any possibility of misinterpretation of shadows indicating a roofing of the pituitary fossa.

*Hydrocephalus.*—Manges discusses the roentgen findings in hydrocephalus, which may be acute or chronic, congenital or acquired. In the acute type the findings would be a wide separation of the sutures in children; absence of convolution markings, if external, and presence of convolution marking soon after the onset if the patient should survive, if internal. Congenital internal hydrocephalus is a frequent form of the chronic type. It comes on at birth or shortly after, and is usually easy of clinical diagnosis, and hence is not properly included in the roentgen findings. The findings of the roentgen ray, however, would be a thin skull, large head with or without depressions and separation of sutures.

The acquired type may come on at any age and is difficult of clinical diagnosis. Manges does not know how long the condition must exist before producing convolution depression shadows, but he believes that the roentgenogram would reveal them soon after or possibly before the onset of marked symptoms; and the symptoms often exist for a year or more.

*Pineal Gland.*—During the past two years Manges has found shadows of what seemed to be small calcareous deposits in the region of the pineal gland, varying in size from very minute spots to as much as half an inch in length. They occur with almost exasperating frequency, exasperating because their significance is not known. In the majority of instances there was associated more or less irregularity of the sella turcica; in one it was distinctly acromegalic, and in many others where there was hypertrophy of the clinoid processes; several were apparent epileptics and two had mental disorders. Two patients had exophthalmic goitre. In nearly every instance the patient was sent for *x-ray* examination because of obscure head symptoms. Manges feels that it is of clinical significance and related to the disorders of the ductless gland series. It is impossible to deduce the importance of these foreign bodies from the known physiological functions of the pineal body, but since there is a well-established belief that its functions are interrelated with those of the pituitary, thyroid, adrenals, ovaries, and testes, we believe that these findings should point to a new field of investigation.

That the presence of macroscopic concretions is not of common post-mortem notice may be inferred from a statement in Cushing's work on the pituitary, to the effect that he regretted not having made systematic investigation of the pineal body; and he does not make mention of such findings in the text ascribed to the *x-ray* findings.

*Fractures of the Skull.*—Demands upon the roentgenologist for roentgen evidence of depression fractures of one or both tables

of the skull, as a basis for an operative attack upon epilepsy, are becoming frequent. The Jacksonian type of epilepsy is recognizable from the clinical symptoms. Frequently the depressed fragment of the inner table over the motor area is discovered by roentgen negatives. Such evidence is valuable. Often no apparent lesion of the skull is discovered, even with the history of injury and the presence of a scar.

The shadows of the sphenoparietal sinus, which are in the vicinity of the motor area, must not be misinterpreted as a fracture. Again, where the sphenoparietal sinus approaches and enters the longitudinal sinus at the vertex of the cranium there frequently appears to be a shadow which has been misinterpreted as a depression of the inner table.

Stereoscopic negatives aid in avoiding the foregoing errors.

One must learn to recognize the shadows of the meningeal grooves and the diploëic veins. They are easily confused with linear fractures.

It is remarkable what extensive linear cracks in the skull may be portrayed roentgenographically without symptoms of any moment. On the other hand, the case presenting marked pressure symptoms from hemorrhage following the fracture-rupture of a meningeal vessel will frequently defy definition by the roentgen negative. One must not wait for the roentgen negative to determine a site for the trephine opening in these cases, but attack the case sharply upon the clinical localization.

The localization of foreign bodies will be discussed in a future review. Innumerable and valuable methods have been proposed with a success proportionate to the individual skill of the roentgenologist.

## EXPERIMENTAL NEPHRITIS.

## A REVIEW OF RECENT LITERATURE.

By RALPH L. THOMPSON, M. D., of the Editorial Staff.

1. Aschoff (*Arch. Int. Med.*, December, 1913).
2. Christian (*Arch. Int. Med.*, May, 1913).
3. Christian (*Journ. Amer. Med. Assoc.*, Vol. 61, No. 4).
4. Christian and O'Hare (*Journ. Med. Research*, Vol. XXVIII, No. 1).
5. Fitz and Rowntree (*Arch. Int. Med.*, Vol. XII, No. 1).
6. Frothingham, Fitz, Folin and Denis (*Arch. Int. Med.*, Vol. XII, p. 245).
7. Karsner and Denis (*Journ. Med. Research*, Vol. XIX, No. 3).
8. Kraus (*Arch. Int. Med.*, Vol. XI, p. 613).
9. Longcope (*Journ. Exper. Med.*, Vol. XVIII, No. 6).
10. MacNider (*Journ. Med. Research*, Vol. XXVIII, No. 3).
11. Martin and Petit (*Ann. de l'Inst. Pasteur*, Vol. XVIII, No. 7, July, 1913).
12. Mosenthal and Schlayer (*Deutsch. Arch. fuer klin. Med.*, Bd. 3, Nos. 3 and 4).
13. O'Hare (*Arch. Int. Med.*, Vol. XII, No. 1).
14. Oka (*Virchow's Archiv*, Bd. CCXIV, No. 1).
15. Pearce (*Journ. Exper. Med.*, Vol. XVIII, No. 2).
16. Pearce and Ringer (*Journ. Med. Research*, Vol. XXIX, No. 1).
17. Rowntree, Fitz and Geraghty (*Arch. Int. Med.*, Vol. II, p. 121).
18. Underhill (*Journ. Biological Chem.*, Vol. XII, p. 115).
19. Underhill, Wells and Goldschmidt (*Journ. Exper. Med.*, Vol. XVIII, No. 4).
20. Walker and Dawson (*Arch. Int. Med.*, Vol. XII, No. 2).

From the experimental point of view the kidney undoubtedly is one of the most interesting organs open to the attack of the laboratory worker, both from a morphological and a functional standpoint. While perhaps the promises suggested by the early work of such men as Ophuls, Mackenzie, Christian, and others have not been wholly fulfilled, still a great deal has been added to our knowledge of the structure and the function of this important organ.

Before summarizing the more important experimental work on this subject of the last year or two, it is well to consider some parts of the address of Aschoff, as this offers a good basis for orientation, both as to our more intimate knowledge of the finer morphological structure of the kidney and the classification of the various renal poisons as they have been used experimentally in relation to their specific action on the histological units of the organ.



Aschoff divides the renal tubular system as follows: The capsular epithelium, the convoluted tubule of the first order (*Hauptstuecke*), Henle's loop, the convoluted tubule of the second order (*Schaltstuecke*), and the collecting tubules. Further, the ascending limb of Henle's loop is divided into a lower cloudy and an upper transparent portion, also the narrow tubule which unites the ascending limb of Henle's loop with the *Schaltstueck* is separated out as the *Zwischenstueck* or connecting piece. And, finally, there is a differentiation between the primary connecting tubules and the main connecting tubules.

In addition to this seemingly sufficient complicated division, a further division is made because of results obtained from a study of Altmann preparations and vital staining.

On the basis of this division it is possible to study the effects of various renal poisons as to whether damage was done to the entire *Hauptstueck* diffusely, or whether the poisons possessed a selective action on certain portions only. On this basis Aschoff divides these poisons into three groups:—

1. Those which damage mainly the terminal portion of the *Hauptstueck*, but whose action may under the influence of larger doses also extend somewhat upward on to the middle division of the *Hauptstueck*. Very rarely and only when extremely large doses are administered will the action extend on to the proximal division of the *Hauptstueck* as well. To this group belong sublimate and cantharidin.

2. Those in which the damage area is chiefly limited to the spiral portion of the distal division of the *Hauptstueck*, spreading downward toward the Henle loops and upward onto the middle division, but rarely reaching as high as the proximal division. Characteristic of this group of poisons is uranium.

3. Those which primarily damage the proximal and middle divisions of the *Hauptstueck*, though with larger doses spreading downward on the distal and transitional divisions. To this group belongs chiefly chromium.

Oka, working under the direction of Aschoff, has studied the histology of vinylamin nephritis in rabbits. Vital staining with carmine solution sometimes followed and sometimes preceded the injection of the drug (bromathylaminbromhydrat was used). The average time of death was about four or five days. Without describing the histology of lesions produced, it may be briefly stated that an important point is brought up in experimental work of this sort owing to the fact that different pictures were obtained depending on whether the drug or the stain was injected first.

Uranium has been one of the favorite drugs used for producing an experimental nephritis. Not only does this drug produce a tubular nephritis, with damage to the distal division of the *Hauptstueck* and below, as described by Aschoff, but also Christian and O'Hare have shown that glomerular lesions, in the rabbit's kidney at least, have been found following injections of uranium nitrate. These glomerular lesions are evidenced mainly by the appearance of hyaline droplets in the capillary walls. Fibrin thrombi may also be found in the capillaries. Hemorrhagic lesions are described as well as a dilatation of the glomerular spaces with granular material. Finally, proliferative lesions, affecting chiefly the capillary endothelium, are also described by these authors. In the dog, O'Hare

was unable to produce any marked glomerular lesions with uranium nitrate, although in these animals hyaline droplet formation in the capillary tufts was occasionally encountered. Combining *B. coli communis* with uranium and injecting simultaneously or at alternate intervals, chronic lesions were produced similar to those found in man in chronic interstitial nephritis.

In addition to a study of the lesions produced by uranium, considerable work has been done on the effect of diuretic and other drugs in acute uranium nephritis. Underhill found that sodium tartrate when introduced subcutaneously in rabbits produced a degeneration of the tubular epithelium, and Underhill, Wells and Goldschmidt, studying this subject farther, found that after such injection the sodium tartrate does not appear in the urine. No glomerular lesions were found. The convoluted tubules were specifically affected, no finer distinction being made. In a third paper on this subject, a study of metabolism shows nitrogen elimination diminished, and sodium chloride, on the other hand, rapidly eliminated. The authors conclude from this that the convoluted tubules are concerned in the formation of urea, while the glomeruli have to do with the chlorides and water.

Pearce and Ringer, working on dogs, add to the above the fact that the occasional occurrence of glomerular lesions may be observed. These lesions are exudative in type. The reason that mouth administration does not always result favorably in these experiments is due to the fact that diarrhea may cause the rapid removal of the salt from the intestine, and thus, by reducing the amount of absorption of the drug, prevent the severer types of lesion.

MacNider found that anesthetics increase the severity of these lesions. This author employed mixtures of chloroform and alcohol subcutaneously as well as ether and morphine. The chloroform-alcohol combination (Grehant's anesthetic) was followed by more marked lesions than were the other anesthetics.

Walker and Dawson found in rabbits that such diuretics as theocin, caffeine, and potassium acetate shortened the lives of these animals if given when they have severe acute uranium nephritis. Spartein sulphate did not seem to be as detrimental as these other drugs. Even water in large amounts shortened the lives in some cases. These authors conclude that diuretics are contraindicated in acute severe nephritis.

Christian and O'Hare found that diuretin given to rabbits with a severe fatal experimental nephritis shortened the duration of life in these animals. However, some animals with severe nephritis survived, so that the authors suggest that diuretin may be beneficial if used cautiously in moderately severe cases of acute nephritis. In a later article Christian suggests the need of careful reexamination of the effects of various diuretics in nephritis, since he found, for instance, that theobromin sodium salicylate seemed to have little if any influence on the nitrogen retention or on excretion in rabbits having severe nephritis.

Among other papers dealing with the function of the kidney in uranium nephritis may be mentioned those of Kraus, and of Frothingham, Fitz, Folin and Denis. Kraus found that creatinin excretion is diminished and uric acid excretion is increased in this condition. The work of the latter authors deals with the relation between non-protein nitrogen retention and phenolsulphonephthalein excre-



tion in renal uranium nephritis. They find that the degree of variation from the normal agrees on the whole with the amount of destruction demonstrated histologically in the kidney.

Extensive work on kidneys subjected to this same drug, as well as chromium with a view to a study of fatigue and diuretics, has been carried out by Mosenthal and Schlayer. These authors find that if salt is injected into normal animals there is no evidence of renal fatigue either in regard to the volume of urine excreted or the vascular response of the kidney. When caffeine is injected repeatedly, there is evidence of fatigue, repeated injections inducing a steady decreasing volume of urine and sodium chloride content. In chromium nephritis, injections of caffeine reduced the amount of urine, while salt acted as a marked diuretic; salt did not produce diuresis in uranium nephritis, but caused fatigue as indicated by diminished amounts of urine.

Not only drugs but various sera, as is well known, have also been used for the production of experimental nephritis. Pearce has done further work on the lesions produced by rattlesnake venom. He describes an acute exudative glomerular nephritis, but is unable to carry it on to the subacute and chronic types that are seen in man. Karsner and Denis did not succeed in producing these lesions in cats by means of rattlesnake venom. These authors have done extensive work on metabolism in a wide variety of experimentally produced kidney lesions.

The effect of chronic passive congestion on the function of the kidney has been studied by Rowntree, Fitz and Geraghty, and by Fitz and Rowntree. These first experiments consist in the study of the elimination of phenolsulphonephthalein, lactose, salt, potassium iodide and water, following constriction of the renal vein. It was found that lactose offered the most delicate test for renal involvement, while phenol gave the most reliable information concerning renal insufficiency. As to the surgical importance of the time the renal vessels may be clamped without permanent injury to renal function or renal tissue, Fitz and Rowntree concluded that in rabbits and dogs with one kidney removed, the circulation of the other kidney may be clamped for forty minutes with recovery. During this time, however, temporary disturbance in renal function is shown by the presence of albumin and casts in the urine, by a diminished phthalein output, and by a delayed lactose and iodide excretion. The normal function is regained inside of six days, although permanent injury may be done certain parts of the kidney. These lesions, which are not progressive, consist in areas of connective-tissue proliferation. In rabbits possessing one normal kidney the time may be extended to one hour, during which period the other kidney can be deprived of its circulation without permanent injury.

The production of experimental nephritis by means of repeated protein injections was suggested to Longcope from the observation of patients with nephritis who showed occasional exacerbations of general edema, fever, albuminuria and sometimes urticaria and eosinophilia, thus simulating in many respects serum sickness. For these experiments, various animals were injected with such protein as egg white and horse serum. The animals were first sensitized and later intoxicating doses were given as in ordinary anaphylactic work. In dogs and rabbits, there developed a well-



marked nephritis characterized by degeneration and necrosis of the epithelial cells of the Henle loops, of the collecting tubules and sometimes of the convoluted tubules. This was accompanied by small round-cell infiltration of the interstitial tissue, and later there was fibrosis. Acute and chronic glomerular changes were also observed. Sensitization of the animals increased the toxicity of egg white.

By means of a milk diet (*poudre de lait*), Martin and Petit have succeeded in producing a nephritis (as well as hepatic cirrhosis) in rabbits and in rats. It is to be hoped that this latter work may escape the eye of the prohibitionist.

## DIAGNOSTIC AND THERAPEUTIC NOTES.

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MAGNESIUM SULPHATE TREATMENT OF TETANUS.—Weintraud (*Berl. klin. Wochenschr.*, No. 42, 1914). The German journals devote much space to the treatment of tetanus following wounds received in the trenches. Most of the writers express themselves favorably in regard to the treatment suggested nearly eight years ago by Meltzer and Auer of the Rockefeller Institute. It consists in the intraspinal injection of a 25 per cent. solution of magnesium sulphate, in a dose of 1 c.cm. for every 10 kg. of body weight. Kocher prefers to give 5-10 c.cm. of a 15 per cent. solution after withdrawing an equal quantity of spinal fluid. The results have been satisfactory symptomatically. The patient is kept much more quiet than with other methods of treatment and death through exhaustion is less imminent. In addition to the intraspinal injections 15-20 c.cm. of a 20 per cent. solution may be injected hypodermically several times daily. In no case, however, must the magnesium sulphate be given intravenously as immediate death may ensue. The writer also advocates the use of tetanus antitoxin both hypodermically and therapeutically and the treatment of the site of infection by means of hydrogen peroxide.

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RESULTS OF OPERATIVE TREATMENT OF EXOPHTHALMIC GOITRE.—Glaserfeld (*Mittheil. aus dem Grenzgeb.*, Vol. 28, No. 1). This article was recently awarded the Moebius prize. It is so full of detail that an adequate summary is not possible. There were 110 deaths out of 2,032 thyroidectomies, *i. e.*, 5.4 per cent. The permanent results were good in 82 per cent. of the cases. The failures were due partly to the removal of an insufficient portion of the gland, partly to a neuropathic constitution. The promptest improvement was seen in thyreogenic psychoses and in cases with diarrhea or amenorrhea. Next in order of promptness of relief comes tachycardia and tremor. Exophthalmus is more persistent, being cured in only 53 per cent. of the cases. The results are distinctly better than those obtained by internal treatment. The writer advises against thyroid implantation and operations upon the thymus or the sympathetic ganglia.

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THE NORMAL DIFFERENTIAL LEUCOCYTE COUNT.—Miller (*Bull. Johns Hopkins Hospital*, October, 1914). The normal variations in the differential leucocyte count are so great, that this sign must be utilized for diagnosis with great caution. The interpretation of any differential count must be based upon a knowledge of that particular individual's normal blood picture, when possible; upon the average values for the locality in which that individual resides; and

upon a consideration of those factors peculiar to the individual which might modify that particular blood. These sources of error are especially important when it is a question of lymphocytosis, the diagnostic value of which has usually been exaggerated. Only when the mononuclear elements constantly exceed the average percentage, absolute values, and upper limits of variation (35 to 49 per cent.) for the community, and when all modifying factors are considered, should one attempt to draw valuable conclusions from the figures obtained.

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**TUBERCULOSIS OF THE BRONCHIAL GLANDS AND LUNG HILUS.**—Stall and Heublein (*Amer. Journ. Med. Sci.*, September, 1914). Tuberculosis in children usually involves the bronchial glands and the lung hilus. The early symptoms are usually indefinite, there may be no cough and no involvement of the apices. There are, however, usually present certain physical signs very suggestive of this lesion. These are the 'hilus dimple' (noted anteriorly over the hilus region at the end of inspiration), dilated veins, parasternal and paravertebral dullness, and most significant of all, a well-marked whispered bronchophony in the interscapular region (d'Espine's sign). Radiography, and especially stereo-radiography, is of the utmost value in these cases.

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**CONGENITAL HEART DISEASE.**—Dunn (*Amer. Journ. Dis. Child.*, September, 1914). A child with cyanosis, and either an enlarged heart or a thrill or both, has probably a congenital pulmonary stenosis. If this is the only lesion, an early death is the rule; if the ductus arteriosus is patent, however, the prognosis is fairly good. A congenital cardiac murmur, without cyanosis, but with cardiac enlargement, is usually due to a defective interventricular septum. If there is a murmur, without either cyanosis or enlargement, especially if the murmur is markedly transmitted into the vessels of the neck, or if it extends into diastole, the case is probably one of open ductus arteriosus alone. When the murmur is a 'humming-top' note and extends throughout the cardiac cycle, the diagnosis of the lesion is almost certain. The prognosis in these cases is very good.

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**GASTRIC CRISES AND VAGOTOMY.**—Exner and Schwarzmänn (*Mittheil. aus dem Grenzgeb.*, Vol. 28, No. 1). The writers advocate the bilateral, subdiaphragmatic resection of the vagi for the relief of gastric crises. All of the vagi resected by them showed histologically severe degenerative changes. Of 14 patients, so treated, 7 were completely relieved, 2 were improved, 4 not improved and 1 died. The mortality is thus much less than in the Foerster operation. Exner believes that his failures can be explained by the assumption that, in these cases, the sensory innervation of the stomach was not through the vagus. Hereafter he proposes to determine the course of these fibres by injecting novocain into the posterior roots, during a paroxysm, before deciding whether to do a vagotomy or not.

The occurrence of organic disease of the stomach, coincident with gastric crises must not be forgotten. In 10 laparotomies for the



relief of gastric crises, a peptic ulcer was found 6 times. In 75 autopsies, gastric ulcer was noted 5 times, cancer of the stomach 3 times.

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PERMANENT DRAINAGE IN ASCITES.—Oberst (*Zentralbl. fuer Chir.*, No. 37, 1914). Various methods have been proposed for the purpose of draining the ascitic fluid permanently into the subcutaneous tissue. That of Oberst has the advantage of simplicity. Under local anesthesia, a small opening is made into the peritoneal cavity, the fluid is evacuated, and a small strip of skin placed, with one end in the peritoneal cavity, the other in the subcutaneous tissue. The wound is then closed. The strip of skin may either be folded upon itself or rolled into a tube. In either case the cutaneous tissue resists absorption and keeps the peritoneal opening from closing. It acts as a permanent drain and prevents reaccumulation of the ascitic fluid.

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SALVARSAN IN SCARLET FEVER.—Glaser (*Deutsch. med. Wochenschr.*, No. 38, 1914). Salvarsan injections were given to 42 cases of scarlet fever, of which 18 appeared to offer an unfavorable prognosis. In about half of these cases, the injection was followed by a critical fall of temperature. The angina was influenced most favorably, the toxic symptoms less decidedly, the complications and sequelæ not at all. The period of desquamation was not shortened.

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DIAGNOSIS OF HYSTERIA.—Jurmann (*Neurol. Zentralbl.*, No. 20, 1914). In most cases of hysteria, an unpleasant sensation is experienced by the patient when the patellar reflex is elicited. This phenomenon does not occur in neurasthenia, nor in dementia præcox or paralytica, so that it may be utilized in differential diagnosis.

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RHEUMATOID ARTHRITIS.—Brown (*British Med. Journ.*, October 17th, 1914). Rheumatoid arthritis is usually due to the absorption of toxic products, pyorrhea alveolaris being responsible for 70 per cent. of all cases. Other causes are leucorrhea, local suppurations, worry and thyroid changes. The disease is curable if the causative intoxication can be removed.

# PRACTICAL MEMORANDA

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## ABBOTT'S METHOD IN SCOLIOSIS.

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By WM. T. COUGHLIN, M. D., St. Louis.

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Simple scoliosis is perhaps the most common deformity of the spinal column. It is a most unsightly deformity and to its victim acts as a severe handicap in his struggle for existence. It is a condition easy of recognition and, early recognized, its progress may be checked and, even in many cases not seen until the disease is well advanced, much may be done toward restoring the spine to its normal condition.

Practitioners, as a rule, are not aware of these facts, and hence the laity must remain in ignorance of them. Scoliotics (primary) would disappear entirely if the general practitioner and the general public were aware of the dangers of the condition and the ease and safety of its relief or prevention.

Much has been heard of late of Abbott's method of treating scoliosis. I have seen my teacher of orthopedics, Dr. A. J. Steele, of St. Louis, many times use practically the same method, more than twelve years ago, and the profession should be grateful to Dr. Abbott for his work. Briefly it consists in pulling and counter-pulling by means of wide bandages and pads laterally on the column until if possible the deformity is over-corrected, and then in applying a plaster jacket to produce pressure, counter-pressure, and fixation of the spine in its corrected position. No anesthetic need be used; one applies the traction up to the point of toleration and fixes in that position, and some weeks or months later repeats the process as need be. The results are excellent, but do not imagine that they can be obtained in a fortnight. The patient must wear the jacket for some time, and after its removal must be kept closely under observation, for should the scoliosis show the slightest tendency to recur the jacket must be reapplied. Exercises and massage to strengthen the muscle of the opposite side of the body succeed the removal of the jacket.

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## TREATMENT OF FISSURE.

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By WM. T. COUGHLIN, M. D., St. Louis.

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Patients with hemorrhoids who complain of severe pain or long-continued soreness are often the victims of fissure or ulcer. The pain is not directly proportional to the size of the ulcer (or fissure); even a very small one may produce most exquisite torture, and a very careful inspection should always be made before concluding that fissure or ulcer is not present. The sphincter is often in such

a state of contraction that recourse must be had to an anesthetic. Local anesthesia with 4 per cent. cocaine will often suffice, but in the presence of acute inflammation it is valueless. A small wisp of cotton (with a string tied to it) wet with the solution is placed in the anal canal. Two or three may be used together, and after two and a half to three minutes they are withdrawn and others inserted. This is continued until the mucosa is anesthetized, which it will be in from ten to fifteen minutes. A larger speculum may now be used and after cleaning the surface of the ulcer a saturate solution of potassium permanganate is applied to it; then a small bit of gauze or cotton covered with some bland ointment is applied and the speculum withdrawn. The treatment should not be repeated before the third or fourth day, but is to be kept up until healing is complete. I have often hastened matters by having the patient get a set of dilators (*e. g.*, Young's) and use them morning and night beginning with the smallest size, and, as soon as he can, using the next and so on. If it is only a simple ulcer, healing is rapid under this form of treatment. Sometimes the sphincter or its superficial fibres must be cut. This may almost always be done under local anesthesia, but in addition to applying the cocaine to the surface as described above, we inject novocain from without upward under the ulcer into the sphincter along the track through which it is intended to cut.

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### SCHLEICH'S SOLUTION.

By A. T. BLACHLY, M. D., Portland, Oreg.

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In giving diphtheria antitoxin, inject 15 minims of Schleich's solution into the skin at the site of the serum injection, thereby raising a wheal through which the large antitoxin needle can be pushed without the slightest pain. Tablets can be obtained containing cocain hydrochloride 1/10 gr., morphine hydrochloride, 1/40 gr., sodium chloride C. P., 1/5 gr. One to one hundred minims of water makes a safe anesthetic which can be prepared in one minute by dropping a tablet in 1½ teaspoonfuls of boiled water. The pain saved is well worth the little additional trouble.

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### THE ELECTRIC SOLDERING IRON AS A CAUTERY.

By V. P. BLAIR, A. M., M. D., F. A. C. S., St. Louis.

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The electric cauteries that have been offered to the medical profession have been expensive, notoriously delicate, and unreliable. So true is this, that for gross work the Paquelin cautery and the ordinary soldering iron have not been replaced by them. In many kinds of soldering work, where the iron is continuously in use, the electric soldering iron is replacing the older tool that required fire heating. To be used in commercial shop work a tool must be efficient, durable and relatively cheap. The electric soldering iron of



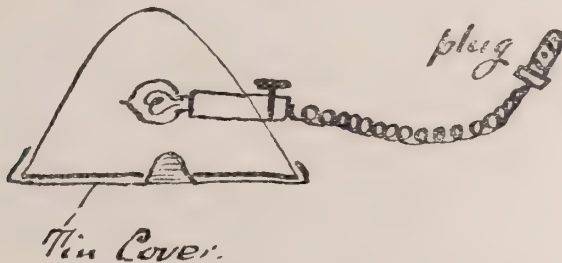
good quality is all of this, and happens to have just the temperature that is so desirable for cautery work. It destroys tissue, turning it into a white, cooked mass with hardly any charring and no hemorrhage, yet its continuous unvarying heat makes it work rapidly.

### A CHEAP ELECTRIC HEATER.

By EDWARD VON ADELUNG, M. D., Oakland, Cal.

The following device has been used as a substitute for a rubber hot-water bag for over two years, and has proved more effective, more convenient, and cheaper. So much so that I have decided to put it into print.

The outfit consists of a two-candle-power carbon filament lamp in an ordinary metal scoop-like reflector (as sold in all electric stores), with sufficient cord and a plug to connect with a convenient fixture. The reflector is converted into a metal box by a sheet of tin which is cut the proper size to close the open side of the reflector, leaving small ears to be bent over to hold the tin on. To prevent the metal



from coming in contact with the skin, the box is slipped into a flannel or cotton bag with a drawstring. The arrangement is made clear by the sketch. A sixteen candle-power lamp burning twenty-four hours in this box will not light bed-clothes or even paper, so that with a two candle-power lamp there is absolutely no danger of fire. Still such a small lamp yields all the heat that one can stand.

Many of my patients find the device a very great comfort. The ease with which one can use it without getting out of bed renders it especially convenient, and gives it a great advantage over the rubber bag. It cannot leak.

In sickness it is superior to the water bag or bottle, because it maintains its temperature, and is not heavy. When placed over clothes rung out of hot water, and the whole covered with flannel, a poultice is obtained superior to the ordinary poultice, and not requiring renewal. Its many applications in health and in sickness suggest themselves.

Any electric house can put the parts together at a cost of not over two dollars. The amount of current used is very small, and the cost of maintainance is practically zero.

## BOOK REVIEWS.

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PSYCHOPATHOLOGY OF EVERYDAY LIFE. By Professor Dr. Sigmund Freud, LL. D., Authorized English Edition, With Introduction by A. A. Brill, Ph. B., M. D., Chief of Clinic of Psychiatry Columbia University, etc. etc. New York: The Macmillan Company. 1914. Price, \$3.50.

In the year 1898 Freud published a short essay on the psychic mechanism of forgetfulness. This as a starting point forms the basis for the present work. As a result of psychanalysis on a common case of temporary forgetfulness of proper names, Freud reached the conclusion that this common occurrence admits of an explanation which goes beyond the customary utilization of this phenomenon. Freud assumes that the displacement which takes place in a common case of forgetfulness is not due to psychic arbitrariness, but that it follows lawful and rational paths. In recapitulating the cases of forgetfulness of a name he finds (1) there exists a certain disposition to forgetting the same; (2) a process of suppression takes place; (3) the possibility of establishing an outer association between the concerned and the element previously suppressed. He does not assert that all cases of name-forgetting are of the same genesis. There are no doubt many cases of name-forgetting that are produced in a very simple sort of way, but beyond the simple forgetting of names there is another forgetting which is motivated by repression. This then forms the groundwork of psychopathology of everyday life. In other words, a great many phenomena which we have been accustomed to explain by chance and coincidence are really to be explained by a very definite process connected together by two chief psychological activities: First, the suppression of disagreeable facts or disagreeable emotions connected with them; and second, the substitution for them of other facts which bear no such burden.

Freud has divided his book into a number of chapters in which he investigates certain common phenomena, such as forgetting of proper names, forgetting of names and order of words, mistakes in speech, mistakes in reading and writing, forgetting of impressions and resolutions, erroneously carried-out actions, symptomatic and chance actions, combined faulty acts. The last chapter is devoted to a consideration of determinism.

As a result of his investigations on the afore-named subjects he comes to the following conclusion: "Certain inadequacies of our psychic capacities—whose common character will soon be more definitely determined—and certain performances which are apparently unintentional prove to be well motivated when subjected to the psychanalytic investigation, and are determined through the consciousness of unknown motives."

It can readily be seen that Freud's theory is of great interest and of a great deal of psychological importance. Whether he has proved his thesis or not, the reading of this book is thoroughly enjoyable. There are numerous new points of view told in an interesting and suggestive manner. The theories are set down in a modest fashion, and the reasons for the conclusions arrived at are clear and unmistakable. It is impossible to say of them that they are unbelievable or without foundation. In many ways it is a model of psychologic analysis, and the proof of the assertions that are concluded in the chapters of this book are to be arrived at by personal experience and trial. In this manner there is no doubt of the stimulating effect which the reader is bound to feel; and one of the tests of a good book lies in this fact, that its careful reader will be impelled to go over the ground himself in order to test out the accuracy of the observations and the logical inferences of the conclusions. There is also a curiously personal touch to this book which reveals the Freudian spirit in investigation in the hands of the investigator himself; and it seems to the reviewer that there is no place in all Freud's works where the reader can be more intimately in touch with the personality of Freud. Apart from its inherent interest, therefore, the book is most earnestly recommended for this reason.

The translation is very well done. It is a great improvement over Brill's earlier efforts in this direction. Those who are intimately acquainted with Freud in the original can best appreciate how well Brill has accomplished the difficult task of turning Freudian literature into readable English.



ROSE AND CARLESS'S MANUAL OF SURGERY. For Students and Practitioners. Ninth Edition. Revised by Albert Carless, M. B., M. S. Lond., F. R. C. S., Professor of Surgery in, and Surgeon to, King's College Hospital, London, etc. etc. New York: William Wood and Company. 1914. Price, \$6.00.

No startling discoveries have been made, and no revolutionary methods have been developed since the appearance three years ago of the eighth edition of this work. There have been introduced, however, improvements in application of certain measures previously employed, so that the author has considered it advisable to incorporate a new chapter devoted to the use of heat, light, electricity and radium in surgery. Other chapters have been revised and the entire book brought thoroughly up to date. Thinner paper has compensated for the increase in the number of pages, the bulk of the volume thereby remaining unaltered. The arrangement of the chapter heads is practically identical with preceding editions, and the same systematic classification of various subjects is observed.

Probably all have felt that there will never be produced a single volume of surgery which is quite satisfactory; and a review of the present volume more firmly entrenches that belief. For despite its comprehensive scope, certain subjects have been discussed quite too sparingly; and with all its excellent general balance, other subjects are unnecessarily prolonged. Ludwig's angina deserves more than a short paragraph; a single page is insufficient for local anesthesia; Rollier's experience scarcely warrants the dismissal of the therapeutic value of sun in three lines, especially since the author sees fit to devote an entire new chapter to the use of heat, light, electricity and radium. At least a note in reference to the inguinal route of approach in the operation for femoral hernia would be gratifying. We fail to appreciate the value of including diphtheria among the surgical diseases of specific infectious origin without directly alluding to the surgical conditions to which the infection may give rise. And a text of general surgery hardly demands eight pages for a discussion of gonorrhea.

This type of criticism is not peculiar to this particular book, but is generally applicable to the common class of textbooks on surgery. There are, however, many excellencies which this volume possesses beyond the others. We have previously alluded to its comprehensive scope and its systematic arrangement. We desire in addition to characterize it as accurate and thorough and completely modern. Salvarsan, radium, anoci-association, operative treatment of simple fractures, spinal anesthesia, splenectomy, and many other of the newer subjects claim their places with the old. The author's discussions of moot questions are delightfully clear and impartial, and his conclusions (with the possible exception of the value of splenectomy in pernicious anemia) eminently sound. Certainly neither student nor practitioner will go amiss in following the teachings of the volume and in cultivating the attitude of sensible, hopeful conservatism so largely reflected therein. And while we reiterate that we shall probably never possess a single volume of surgery which is completely satisfactory, we accept this as the best which has yet appeared.

LOCAL ANESTHESIA—ITS SCIENTIFIC BASIS AND PRACTICAL USE. By Prof. Dr. Heinrich Braun, Obermedizinalrat and Director of the Kol. Hospital at Zwickau, Germany. Translated and Edited by Percy Shields, M. D., A. C. S., Cincinnati, Ohio. From the Third Revised German Edition. With 215 Illustrations in Black and Colors. Philadelphia: Lea and Febiger. 1914. Price, \$4.25.

In these days of individualization in the treatment of disease, and particularly in the management of surgical patients, it is gratifying to note that specialism in the choice of anesthetics and their administration claims its well-merited portion of attention. The anesthetic is a necessary preliminary to—better perhaps to say a vital part of—every operation, and certainly any effort to limit the morbidity and mortality incident thereto is worthy of commendation. To develop a method free from either is the objective of Prof. Braun in his book on "Local Anesthesia."

In this translation from the German there is discussed in typical thoroughness the history of local anesthesia, its mechanism, the action of various anesthetizing substances, the choice of local anesthetic agents, and aids to local anesthesia. Then follows a description of the various methods for using local anesthetic substances, the value, indications, and general points in technique. The book concludes with detailed descriptions of special technique employed in various operations.

As may be inferred from a survey in the preceding paragraph, the work is more than thorough,—it contains a mass of detailed information which would



scarcely be attempted by any except the apostle of a method, or by a most enthusiastic disciple. Indeed, the voluminousness of some portions is rather disheartening; one may indicate by way of specific example the lengthy pharmacological data as being quite uninteresting to the majority of readers. The author's enthusiasm for the method is perhaps responsible for the abbreviated discussion of the indications and limitations of local anesthesia, and also for failure to mention increased liability of secondary capillary hemorrhage when adrenalin is used as an adjuvant to the anesthetic.

The book is, however, an excellent treatise. The paper and type are good, and the four hundred pages are generously embellished with illustrations and helpful diagrams. Few typographical errors are noted. The translation is very commendable, bespeaking an infinite care and a painstaking accuracy on the part of the translator indicative of a zeal and enthusiasm little short of that of the author. The volume should be considered not only as a highly desirable, but also as a very necessary addition to the library of those interested in general surgery or the surgical specialties.

**LOCAL AND REGIONAL ANESTHESIA.** With Chapters on Spinal, Epidural, Paravertebral, and Parasacral Analgesia, etc. By Carroll W. Allen, M. D., Instructor in Clinical Surgery at the Tulane University of Louisiana, New Orleans, etc. etc. With an Introduction by Rudolph Matas, M. D., Professor of General and Clinical Surgery at the Tulane University of Louisiana, New Orleans, etc. Illustrated. Philadelphia: W. B. Saunders Company. 1914. Price, \$6.00.

Despite the fact that American Surgery has long recognized the importance of local anesthesia and has furnished several pioneers in the field, it has not up to the present time possessed an adequate treatise on the subject. We have been forced to seek information in volumes which, while excellent in their way, were too abridged for valuable references; or we have been compelled to look to German publications. Recently, some excellent translations have appeared; but only with the advent of Dr. Allen's book has a volume commensurate with the dignity of the subject become available.

The book is one of generous proportions, comprising some 600 pp. which are divided into twenty-three chapters. A brief history of local anesthesia and anesthetic agencies prefaces the succeeding chapters which consider the mechanism of sensation and pain, local effects of anesthetic substances, chemistry and toxicology of anesthetic drugs, the technique of administration, the indications and contraindications, etc. Then follows a detailed account of the methods of use in special operations, and a final chapter devoted to dental anesthesia.

The work is quite complete and is generally well written. A personal note is lent in the introduction by Matas, himself one of the masters in the field. Numerous references are cited and the work is splendidly illustrated. We readily recognize many of the illustrations as being after Braun (which is a guarantee of their excellence), and the author acknowledges his deep indebtedness to Braun's work. The whole volume mirrors the painstaking care of one devoted to his task, as well as the enthusiasm of one deeply convinced of the importance of the field in which he labors. Indeed, we question whether others will not find it difficult to cultivate the same enthusiasm in regard to so general an applicability of the method, but nevertheless we join with the author in urging surgeons to develop as far as possible these 'qualities of head, heart and hand' that are necessary for the successful practice of the art of peripheral anesthesia. The book fills a long-felt need, and a hearty welcome should await it.

**URGENT SURGERY.** By Félix Lejars, Professeur Agrégé à la Faculté de Médecine de Paris, etc. etc. Translated from the Seventh French Edition by William S. Dickie, F. R. C. S., Surgeon North Riding Infirmary, Middlesborough, etc. Third English Impression. With 20 Full-Page Plates and 1086 Illustrations, of which 729 are Drawn by Dr. E. Daleine and A. Leuba, and 198 are from Original Photographs. Vol. 1. Introductory—Head—Neck—Chest—Spine—Abdomen. New York: William Wood and Company. 1914. Price, \$7.00.

This work of Lejars has already gone through seven editions, and the English translation by Dickie is now in its third reprinting. These are facts that testify to the popularity of the work and they are strongly suggestive of more than ordinary worth.

There is much in the excellent make-up of the book—the clear type, excellent paper, and most admirable illustrations that attract the average reader at first sight, and hold his attention until he has thumbed through the whole volume. Then inevitably he is led back for a more critical survey. And this

critical survey leads us to fear that possibly too much principle has been mixed with practice. Lejars' thesis is clearly to present the important details of emergency surgery, and we feel certain that his aim would have been more adequately accomplished had he not included such topics as anesthesia, bandaging, the handling of simple instruments, and the application of various sutures and knots. This additional elementary text is not a blemish; it merely serves to add what we consider to be undesirable bulk to the volume.

The actual description of surgical lesions and their treatment is beyond cavil. In order to emphasize this point, we merely refer to the four or five pages devoted to rupture of the urinary bladder. This subject is discussed under heads and subheads in a fashion clearer than one finds in the ordinary monograph of many pages. Not a surgical indication is overlooked and not a step in technique slurred.

The volume is essentially an operative surgery and consequently devotes no space to a general discussion of symptoms. As an operative surgery it takes rank in its own field with Kocher, Jacobson and the other classic volumes covering the broader field of general surgery.

**PRECIS DE CHIRURGIE DE GUERRE.** Par Edmond Delorme, Médecin Inspecteur Général de l'Armée, etc. etc. Paris: Masson et Cie. 1914. Price, 4 fr. 50.

Not the least interesting feature of this small brochure is the fact that the writing of it was directly stimulated by the declaration of war in Europe and indeed was rendered possible only by the author stealing odd moments from his active war duties.

On broad general lines, it follows the recent volumes on war surgery by Lagarde, of America, and Makins, of England. There are twenty-one chapters devoted to arms and projectiles, wounds of the various tissues, wounds of arteries and nerves, foreign bodies, lesions of the joints, diaphyses, and epiphyses, complications of gun-shot wounds, large projectile injuries, amputations, injuries of head, face, neck, chest, abdomen, kidney and lumbar region, bladder, spinal cord, upper and lower extremities.

Delorme follows a detailed didactic method which, though it does not contribute a large amount of interest to the volume, nevertheless serves to add a very desirable element of clearness. There is never an iota of doubt regarding what the author considers to be the main elements in prognosis, diagnosis or treatment. Nor does he ever fail to emphasize those symptoms which are apt to complicate surgical judgment.

One is struck, in reading the modern volumes on war surgery, by the excellent results obtained by conservative non-operative treatment. At the front practically nothing is done for the patients save to make them comfortable and to follow strictly the laws of asepsis. Even at the base hospital conservatism is the keynote of treatment. Unfortunately, the mass of experience that is accumulating serves a slight utilitarian purpose for the surgeon in civil life who deals with wounds inflicted by softer bullets, fired at short range, with a comparatively slow muzzle velocity. Nevertheless, it is incumbent upon every surgeon to know pretty near all that Delorme has to say.

**THERAPEUTISCHE TECHNIK FÜR DIE ÄRZTLICHE PRAXIS.** Ein Handbuch für Ärzte und Studierende. Herausgegeben von Prof. Dr. Julius Schwalbe, Geh. San-Rat. Mit 626 Abbildungen. Vierte, verbesserte und vermehrte Auflage. Leipzig: Verlag von Georg Thieme. 1914. Price, 26.50 m.

This comprehensive work of over 1,000 pp. embraces the technique of practically all therapeutic measures which a practitioner may be called upon to employ. It even includes the operative technique of some of the more common major surgical procedures, such as herniotomy, colostomy, appendectomy, and curettage, although the advisability of so doing seems rather debatable. The book contains a tremendous fund of useful therapeutic instruction written by such authorities as Wassermann, Adolph Schmidt, F. Kraus, Brugsch, v. Struempell, and Zuckerkandl. The chapter on hydro- and thermotherapy deserves special mention. American practitioners have been particularly unwilling to make any great use of these methods which, as here set forth, are easy of application, and if we may judge by their extensive employment abroad, effective in result. The same may be said of the chapter on therapeutic gymnastics which contains, among other valuable articles, a detailed and profusely illustrated exposition of Frenkel's muscle training exercises for tabetics. The excellent chapter by Hoppe-Seyler on the pleura likewise deserves mention. Thoracocentesis, either for diagnostic or therapeutic purpose, is a most useful but often neglected procedure. Simplicity of method and apparatus to bring



the operation within the armamentarium and skill of anyone is the keynote of this chapter. However, in setting forth the indications for the withdrawal of pleural exudates, the author seems unduly conservative. The specialties are not neglected, a chapter on the eye being particularly useful. It is perhaps needless to say that this fourth edition contains the most recent advances in the therapy of syphilis, the use of radioactive agencies, and the newer aids in the treatment of diseases of the stomach, respiratory and nervous systems.

**TREATMENT OF NEURASTHENIA.** By Dr. Paul Hartenberg. Translated by Ernest Playfair, M. B., M. R. C. P. New York: Oxford University Press. 1914. Price, \$2.00.

This book by Hartenberg, translated very well by Playfair, is an interesting contribution to the subject of neurasthenia. The chief criticism that can be directed against this book is its pure conventionality. Furthermore, the term 'neurasthenia' has become so limited in its application in the past few years, owing to our deeper insight into the question of fatigue, that it is questionable whether the use of the word in the sense that Hartenberg uses it is altogether wise. This book is written out of the large experience of the author, and for that reason there is a certain value attached to whatever he may say; but it is rather unusual at this stage of the development of our knowledge of the psychoneuroses to find treatment put down in such a formal way as is contained in this book; for example, in his outline of treatment of the phobias. To quote from a paragraph may best illustrate the objection which the reviewer has in mind. On the subject of treatment of neurasthenia, and particularly the phobias, he says: "The tremor may be abated with hyoscine; the muscles of the legs may be fortified by electricity, massage, and tonics; the congestive tendency of the face may be subdued by means of cervical galvanisation, by quinine or adrenaline; the cardiac erethism may be lessened by bromide or belladonna. Psychotherapy, aiming at reassuring the patient, will do the rest." The reviewer feels sure that, if such a scheme is followed out by the practitioner, things will not turn out so simple as is here outlined.

The last paragraph of this book is given over to nine conclusions; to some of them there is very serious objection. There is one thing, however, which is very commendable in the whole book, and that is the author's insistence on the term 'fatigue' as expressing the chief symptomatic expression of neurasthenia. In this fact the chief value of this book rests.

**DISEASES OF THE NOSE, THROAT AND EAR.** Medical and Surgical. By William Lincoln Ballenger, M. D., Professor of Otology, Rhinology, and Laryngology, College of Physicians and Surgeons, Department of Medicine, University of Illinois, Chicago, etc. etc. Fourth Edition, Revised and Enlarged. Illustrated with 536 Engravings and 33 Plates. Philadelphia: Lea and Febiger. 1914. Price, \$5.50.

The appearance of the fourth edition of "Ballenger," so soon after the third edition made its appearance, attests strongly the continued popularity of this well-known work. Much of what has appeared in previous editions has been rewritten and improved. The present edition also contains much that is new; some of it so new in fact that it has hardly stood the test which time alone can give; and some which has already failed before the test of this impartial critic, *e. g.*, the Haynes operation on the cisterna magna. That the new should be given along with the old speaks well for the progressiveness of the author in his efforts to make us familiar with the 'last word' in the various lines. On the other hand, few authors have had, in such quickly recurring editions, so eminent an opportunity to keep their works so strictly up to date.

In the present edition we would call special attention to the enlarged space devoted to the labyrinth. In the second edition but one, all reference to this important subject was conspicuous by its absence. The modesty of the author too in only advising the Sluder operation on the tonsils in 75 per cent. of cases deserves commendation.

A feature of previous editions has been the profusion and clearness of the illustrations. This reputation is fully maintained in the present work, there being 536 engravings and 33 plates. In our previous review we spoke of the third edition as the best single volume work on the three subjects of diseases of the nose, throat and ear, in the English language. We take great pleasure in repeating this assertion in regard to the fourth edition.



**GUIDING PRINCIPLES IN SURGICAL PRACTICE.** By Frederick-Emil Neef, B. S., M. L., M. D., New York City. New York: Surgery Publishing Company. 1914. Price, \$1.50.

This is an admirable little volume presenting in clear, concise form what the author considers to be guiding principles of surgical practice. In 160 pp., divided into fourteen short chapters, he discusses the preparation of the patient; preparation and sterilization of utensils, instruments, suture material, etc.; considers hand disinfection, the choice of anesthetics and their administration; and lastly touches upon the operation, post-operative care and the treatment of clean and unclean wounds.

Obviously, the scope is too limited to be of great service to the mature surgeon to whom the development and application of surgical principles is a daily business. It will prove more serviceable to the uninitiated and the beginner,—to the interne and the surgical nurse. However, despite its elementary nature, there are certain paragraphs which the most experienced might study again with profit; for example, the subject of wound healing is discussed in a most accurate and interesting manner.

The book is well written, neatly bound, and thoroughly indexed. Use is also made of marginal notes in red type, but we seriously question both their utility and their attractiveness. The particular charm of the book lies in the highly individual standpoint and a semi-reminiscent style which reflects the happy combination in the same individual of careful scientific study and practical clinical observation. And singularly, paradoxical as it may seem, the general excellencies of the work accentuate its chief deficiency, viz., a too limited scope. As we finish the book we are conscious of a disquieting wish for a presentation of these guiding principles in more detailed form and rather wider range.

**THE UNEXPURGATED CASE AGAINST WOMAN SUFFRAGE.** By Sir Almroth E. Wright, M. D., F. R. S. New York: Paul B. Hoeber. 1913. Price, \$1.00.

This book by the noted bacteriologist, Sir Almroth E. Wright, has been the cause of considerable comment. That a scientist of such unusual accomplishments should write on a subject with so little scientific poise is a curious phenomenon. If on any other subject of scientific import Sir Almroth E. Wright should show so personal a prejudice and so one-sided a point of view, it would serve to cast doubt on almost anything he might afterwards do. It is evident that woman suffrage, like any other question, is capable of being treated in a perfectly frank, clear, unprejudiced way. If one is opposed to woman suffrage there are many reasons why these views might be supposed; certainly an argument based upon pure antagonism and dislike of the subject has no particular value and no particular importance, except as indicating that a great scientist may lose his temper with a subject and thus annoy his reader by an exhibition of discourtesy.

This book is less a contribution to the subject of woman suffrage than it is an exposition of why a leading author in bacteriology should not write upon subjects outside his laboratory unless he uses towards their elucidation the same care, judgment, accuracy, and fair-mindedness that is customary in his scientific work.

**DIAGNOSE UND THERAPIE DER HERZKRANKHEITEN.** Von Prof. Dr. Ludwig Braun, Primararzt in Wien. Zweite, vollstaendig umgearbeitete Auflage. Mit 37 Textfiguren. Berlin: Urban und Schwarzenberg. 1913. Price, 16 m.

One opens each new textbook on diseases of the heart with the renewed hope of finding a complete exposition of modern methods and views in this field, nearly always however to be disappointed. Several volumes on diseases of the heart have appeared in the last twelve months, some of them exceedingly valuable in some aspects of the subject, but woefully defective in others. To this group belongs the new edition of Braun's textbook. It is above all a guide for the practitioner. In its discussion of the management of cardiac cases and, in its emphasis upon impaired function rather than valvular lesion, it deserves high praise. In some other respects, however, the book might have been written five or more years ago. Thus in the discussion of auricular fibrillation (*pulsus irregularis perpetuus*) there is no mention of the important and not uncommon group of cases in which this condition is coincident with a very slow and sometimes even perfectly regular pulse. His description of the auscultatory method of estimating arterial blood-pressure, now rapidly replacing all others, is not only incomplete but directly misleading. In general, the author ignores English and American works nearly completely.

**DIE NERVOESE SCHLAFLOSIGKEIT UND IHRE BEHANDLUNG.** Von Dr. Richard Traugott, Nervenarzt in Breslau. Dritte, voellig umgearbeitete und stark vermehrte Auflage. Mit 2 Kurven im Text. Wuerzburg: Verlag von Curt Kabitzsch. 1913. Price, 2 m.

This is a small treatise on sleeplessness, and contains the author's ideas concerning the origin and best method of treating sleeplessness. The author believes that nervous sleeplessness is not only a symptom, but may be the most important and the only one upon which the patient puts any particular emphasis.

The only valuable part of this little book is the list of substances which may be used in treating this condition. All the well-known hypnotics and some that are not so well known are here discussed, the dose indicated, and the various objections or advantages set down. For a book of its size, and for the modest purpose which the author has in view, there is a good deal of value contained within its pages. It is a good little book to have at hand so as to refer, from time to time, to the author's experience with various hypnotics.

**HYSTERIE.** Zur Frage ueber die Entstehung hysterischer Symptome. Von Dr. J. M. Raimist, Leiter der Nervenabteilung des juedischen Hospitals in Odessa. Berlin: Verlag von S. Karger. 1913. Price, 3.50 m.

This is a small monograph on hysteria, which has for its thesis the proof that symptoms which later become hysterical in their first impressions must be interpreted as emotional and serve as the expression of this or that emotion. The author differentiates between the biological and the individual form of this emotional expression.

Twenty cases are described in some detail as forming the clinical basis from which the psychological analysis is derived. The symptoms presented by these cases are discussed from the point of view of the author's theory.

It must be said that while this monograph contains some interesting statements and the analysis of symptoms from the emotional point of view is suggestive, yet as a whole it throws comparatively little light upon the problem which it attempts to solve. Its thesis would be admitted by almost any one who has followed the recent trend of investigation into hysteria.

**JAHRBUCH DER PRAKTISCHEN MEDIZIN.** Kritischer Jahresbericht fuer die Fortbildung der Praktischen Aerzte. Unter Mitwirkung von Dr. G. Mamlock. Herausgegeben von Prof. Dr. J. Schwalbe, Geh. Sanitaetsrat in Berlin. Jahrgang, 1913. Stuttgart: Verlag von Ferdinand Enke. 1913. Price, 15 m.

Briefly, but still in sufficient detail, the volume summarizes the more important contributions during 1912 in the entire field of internal medicine. The advantage of this kind of an abstract over the sort found in the better medical journals lies in the fact that those bearing upon each subject are grouped together, so that the reader obtains a concise survey of each subdivision of the subject. Each chapter is devoted to one aspect of internal medicine and is in charge of an acknowledged authority in this special field. The bulk of the references are naturally German, but work done elsewhere is by no means ignored. The year-book will be of special service to readers interested particularly in the scientific aspects of medicine.

**MANUAL OF OBSTETRICS.** By Edward P. Davis, A. M., M. D., Professor of Obstetrics in the Jefferson Medical College, Philadelphia. With 171 Illustrations. Philadelphia: W. B. Saunders Company. 1914. Price, \$2.25.

Unusual judgment seems the chief requirement for an author of a brief manual on the subject of obstetrics. It is no easy task to eliminate the unimportant, the unessential, the rare and the superfluous for the sake of brevity without sacrifice to completeness and clearness. Davis, a teacher of students for many years, a master of language, surely had the qualifications to write such a short manual, and one has to acknowledge he accomplished his task successfully. Nevertheless, it would seem debatable whether such a short exposé of obstetrics should include a detailed discussion of monstrosities, or contain four (not very good) illustrations of gonorrheal stomatitis, etc. This volume is a worthy companion of the two other well-known works of the same author: "Operative Obstetrics," and "Obstetric and Gynecologic Nursing."

**LECTURES ON DIETETICS.** By Max Einhorn, Professor of Medicine at the New York Post-Graduate Medical School and Hospital and Visiting Physician to the German Hospital, New York. New York: Paul B. Hoeber. 1914. Price, \$1.00.

This excellent little book is arranged from stenographic notes of the author's



lectures. They retain the charming directness of the actual discourse. No doubt this plan does not allow such a complete treatment of the subject as the usual method, but it preserves the essential points from being buried in a mass of detail. It is for this reason that Dr. Einhorn's book should find a large audience. It is gratifying to note that the author lays much stress upon the proper preparation and form of the food. This most necessary and much neglected phase of dietetics cannot be too forcibly emphasized. The final chapter has to do with duodenal feeding, a method originated by Dr. Einhorn, which has gained widespread recognition.

**MATERIA MEDICA FOR NURSES.** By A. S. Blumgarten, M. D., Instructor in Materia Medica at the German Hospital Training School for Nurses, New York. New York: The Macmillan Company. 1914. Price, \$2.50.

At first glance one is inclined to the judgment that this textbook for nurses is more voluminous than necessity warrants. When we consider, however, that its use is not limited to the training period and that the graduate nurse should have constant occasion to refer to its pages, we readily accede to the author's view as to the necessity for a thorough rather than a sketchy presentation. The inclusion of chapters as "Prescription Reading" and an extended chapter on the technique of handling solutions, calculating dilutions, etc., seems entirely justified. In fact the book must be regarded as an excellent textbook for anyone who wishes not merely to learn but to understand.

**PRACTICAL PRESCRIBING. With Clinical Notes.** By Arthur H. Prichard, M. R. C. S., L. R. C. P., R. N. (Rtd.), Late House Physician, The Brompton Hospital, and Resident Surgeon, R. N. Hospital, Gosport. New York: Oxford University Press. 1913. Price, \$2.00.

We are sorry to have nothing but words of disapproval for this volume. Unless we are entirely misled, the author believes in the strict symptomatic treatment of disease by drugs. To this end he incorporates in his prescriptions a drug for each symptom or 'indication,' often including as many as five active ingredients in a prescription. One does not have to be a so-called 'therapeutic nihilist' to differ with such methods. Moreover, the advisability of teaching prescription writing, according to this plan, seems most dubious; it might even be called dangerous.

**THE CLINICAL HISTORY IN OUTLINE.** By Paul G. Woolley, S. B., M. D., Professor of Pathology, College of Medicine, University of Cincinnati, etc. etc. St. Louis: C. V. Mosby Company. 1914. Price, \$1.00.

The value of a carefully taken history is more often underestimated than not. While it is true that the greatest stress must rest upon the objective information gained by physical examination, yet the man who has learned to take a history properly has a most distinct aid in diagnosis. The statement that histories are misleading would be more correctly conceived if it asserted that histories improperly taken are misleading.

This little volume attempts to guide the student and practitioner in the proper taking of case histories, and will be found most useful for those who believe in careful systematic methods.

**DIAGNOSTIC METHODS. A Guide for History Taking, Making of Routine Physical Examinations and the Usual Laboratory Tests Necessary for Students in Clinical Pathology, Hospital Internes, and Practicing Physicians.** By Herbert Thomas Brooks, A. B., M. D., Professor of Pathology, University of Tennessee, College of Medicine, Memphis, Tennessee. Second Edition, Revised and Rewritten. St. Louis: C. V. Mosby Co. 1914. Price, \$1.00.

This little volume can in no sense be considered a textbook. Used in connection with a larger work as a handy laboratory guide, it may fill a useful place. In a work designed for those who have only a limited time for the laboratory it would seem rather useless to include such time-absorbing procedures as the Wassermann reaction and the complement fixation tests.

**RADIUM THERAPEUTICS.** By N. S. Finzi, M. B. (Lond.), M. R. C. S., L. R. C. P., L. S. A., Chief Assistant in the X-Ray Department St. Bartholomew's Hospital. New York: Oxford University Press. 1914. Price, \$2.00.

This little volume is timely in that it gives one a working idea upon the intricate subject of radio-activity.

The author has treated the subject in as practical a manner as possible,



giving in an introduction a review of the various radio-active bodies and their action. Farther on in the text he treats of the practical application of radium to diseases, with frequent illustrations. To anyone interested in the subject, the volume is well worth reading.

**TRAITEMENT CHIRURGICAL MODERNE DES KYSTES HYDATIQUES NON SUPPURES DU FOIE.** Par le Dr. A. Meudic. 1 Volume gr. in-8 des Annales de la Clinique chirurgicale du professeur Pierre Delbet. Paris: Librairie Félix Alcan. 1914. Price, 5 fr.

This monograph of one hundred and fifty pages discusses in an admirably thorough fashion the subject of hydatids (non-suppurating) of the liver. The author believes that surgery offers the only hope for patients suffering with hepatic hydatid cyst; he advises against attempting to marsupialize the cyst wall, or to enucleate it, but advises most emphatically that wherever it is possible a total extirpation should be made.

**MANUAL OF NORMAL HISTOLOGY AND ORGANOGRAPHY.** By Charles Hill, Ph. D., M. D., Professor of Histology and Embryology, Chicago Veterinary College, etc. etc. Third Edition, Thoroughly Revised. Philadelphia: W. B. Saunders Company. 1914. Price, \$2.25.

Probably there is a place for such a volume as this. There is much elementary histology in the book that is concisely presented, enough, for instance, for dental students for whom the book seems to be particularly designed. The remarks on pathology and physiology which are in some places included, particularly on certain of the ductless glands, should be revised or omitted entirely.

**ERFAHRUNGEN UND BETRACHTUNGEN AUS DER PRAXIS.** Von Dr. August Heisler, Koenigsfeld i. Baden. Wuerzburg: Verlag von Curt Kabitzsch. 1913. Price, .85 m.

The writer maintains that medical journals are too exclusively filled with articles by specialists and laboratory workers. He believes that the busy general practitioner, too, observes much of general value and interest and should be encouraged to share the results of his experience with his fellows. Having recently joined their ranks, he proceeds to set his fellow practitioners a good example. Unfortunately what is of value in his more or less rambling homily is not new, and what is new is of doubtful value.

**CHEMISTRY FOR NURSES.** By Reuben Ottenberg, A. M., M. D., Lecturer to the Nurses Training School, Mt. Sinai Hospital, etc. etc. New York: The Macmillan Company. 1914. Price, \$1.00.

This useful textbook has been written both with the needs and the limitations of the trained nurse in mind. The author avoids confusion by omitting theoretical and technical discussions, yet an attempt is made to give insight into the fundamental facts both of inorganic and organic chemistry. The last chapters discuss the chemical process going on in the digestive tract and the chemistry of the urine with simple methods of uranalysis.

**THERAPEUTIQUE CLINIQUE DES MALADIES DE L'ESTOMAC ET DES SYMPTOMES ASSOCIES.** L. Pron. Librairie Maloine. Paris. 1914.

In America, following the German lead, the treatment of gastric disorders tends more and more to become exclusively dietetic, hygienic and physical. The French, while not ignoring the importance of these methods, still lay much stress upon medicinal treatment, often with a decided leaning toward what we should call polypharmacy. Pron's book furnishes a good example of the French point of view. It is entertainingly written, but like most French medical books has one serious defect, the total absence of an index.

**THE PRACTITIONER'S PRACTICAL PRESCRIBER AND EPITOME OF SYMPTOMATIC TREATMENT.** By D. M. Macdonald, M. D., Medical Officer of Health, Leven, Fife. New York: Oxford University Press. 1913. Price, \$1.50.

The reviewer is extremely doubtful as to the value of this little volume. It smacks entirely too much of 'machine made' therapeutics to recommend itself as a really valuable aid in the modern practice of medicine.

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## EDITORIAL.

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### "ON UNBENDING OVER A NOVEL."

It is a fact, and an undisputable one, too, that we Americans dote on taking medicine. Despite what has recently been written to the contrary, the actual state is almost as bad as it was some decades ago—possibly with this difference that, whereas formerly we gulped down patent medicines with a courage that made the beatific joys of the early Christian martyrs pale into insignificance, we are to-day following the same tactics with drugs that are 'recognized.' Directly a man feels out of sorts, his first thought is the drug store, that is if he is a strictly moral man, or the saloon if he is inclined towards the immoral belief in the efficacy of whiskey to drive away the blues. But let us imagine we are dealing only with an individual of the highest morality, with one who has a weakness for burning incense on the altar of a drug store. With what glee he enters the store, with what confidence he takes the near-patent medicine or the regular medicine prescribed by the druggist! No matter which it is, what he covets has been granted: some sort of medicine to put him in a happy frame of mind again by alleviating the general nervousness that obsesses him. And in case he is too scientific to take what the druggist wishes to give him and resorts instead to his family doctor, is the latter more chary of drugs? No, indeed; the usual formula is prescribed, the patient is admonished not to fail to return in a week or so, and again is presented the delightful spectacle of credulity magnifying the very ordinary qualities of a drug into the exalted virtues of a panacea. Dr. S. Squire Sprigge, the distinguished editor of the *Lancet*, is of an altogether different

opinion, according to his exceedingly clever paper in a recent number of the *Cornhill Magazine*; and we are reproducing it here so that those physicians, who are breathlessly keeping pace with every new drug that is heralded as the one that will relieve mental fatigue, will learn a very true lesson brought home to them by one who is not only a medical philosopher but an artist in words:—

“How many serious persons read novels as a relaxation—not necessarily good novels, and not necessarily bad novels, but novels in the lump? I have an idea that in this direction a capacity for simple amusement has been given to serious men which has been denied to serious women, although this is a guess, and does not at first sight seem to coincide with accepted opinion. For women are commonly said to be the main support of the novelist, and from Lydia Languish onwards the women against whom the humorous writer or depreciatory observer wants to score a point are generally depicted as hardened novel readers. The novel reading of women which is thus condemned, however, is not the novel reading of serious persons as a relaxation. This is no unbending over make-believe adventures of intelligences which in the business routine of life must be kept tightly strung up. I am not questioning what the number of uncritical readers may be, who are uncritical because they can be nothing else. This number is of great importance to all publishers and to many authors, but my curiosity refers to serious persons only. By serious persons grumpy or priggish ones are not implied, but rather people who are engaged daily and regularly in hard and responsible work—work which keeps their attention fixed for long spells of time, and often anxiously; people for whom life is real, and who know the importance of being earnest. I wonder how far it is common for these people to read novels of all sorts; I doubt if they are satisfied with the supply which they receive; and if the number of these readers is greater than is usually supposed, is it not an indication of remissness that authors and publishers do not take the matter with some eagerness into their consideration?

“The hint that there may be a difference in the matter of novel reading between a man and a woman has not been made with any desire to provoke a discussion on sex proclivities; but the sex aspect may have to be considered if we find that the habits of those members of each sex who have the closest approximation to each other in many respects are unlike in their attitude towards fiction. There is among us now a rapidly increasing number of women who fall under the category of serious workers, and in any guess at the extent to which fiction of all sorts is read as a relaxation the number of thoughtful women must be reckoned with who exhibit this sensible habit—for I consider the habit a prudent and pleasant one. I doubt if there are many among them who read novels, uncritically, almost heedlessly, just for the story, for the brief illusion, for the shallow pleasure. Serious women are more closely caught in the toils of their work than serious men. Undoubtedly a very large number of women read novels voraciously, and it would seem, judging from what is provided for their needs in libraries, that they are not in the least particular what they read; but for the most part female clients of the circulating libraries are reading to fill in time. They are not reading to get relaxation. It is not a break in their oc-



cupation which leads them to novel reading; novel reading is their occupation. Women, perhaps, are divided more straitly than men into those who think and those who do not think, and it is these latter who form the audience to which a good deal of the unreadable fiction, nowadays lumbering the shelves of bookshops and libraries, must be addressed. The less intelligent section of men do not read novels at all. The less intelligent section of women are industrious novel readers, and it is their taste that the author and publisher who are working for a popular circulation desire to please; they are the persons responsible for the kind of novel that is so dreadfully common among us—the imitation clever novel, and the machine-made sensational novel.

“These novels are, many of them, labelled the ‘novel of the year,’ and in some fifty-two annual instances are really the novel of the week. Not necessarily bad books, they represent a good deal of industry on the part of their authors, and sometimes are really skilful examples of the particular pattern which they follow. Not infrequently their creators have one or two fairly good books to their credit, on the strength of which they choose to write ten inferior ones; and for one buyer who can see the alteration in standard a hundred will be blind to it. In the vast crowd of such productions a few get lost which were worth a better fate. The reviewers may or may not detect them, but even if they do the public pays little heed to their words, and no amount of favorable notices persuades the circulating libraries to order a book, perhaps by an unknown writer, differing in essentials from the kind which is understood to please. An attempt to obtain such a book will be met with the answer that all the copies are out—the truth, and not in the least surprising, for only a very few copies have been ordered; the applications are not in many cases renewed, and the book fails. The fact that all unsuccessful writers would be likely to bring this accusation against the libraries has to be borne in mind, and many, chagrined that their books have not been subscribed for in greater numbers, have allocated the blame wrongly; but there is little evidence of discrimination displayed in the conduct of our circulating libraries. Credited as they are with an ambition to undertake the task of a moral censorship, they attempt no exercise of literary supervision over what they supply, though with the introduction here of some discretion a great many of their difficulties would disappear, and many of us would repair more blithely to their counters.

“I do not want to put the two things, that many women read too many novels and that too many inferior novels are written, into undue proximity, or to suggest that there is a class among women for whom something is provided that is not good enough for men. There are many men for whom quite bad novels would be quite good enough, but they do not read novels. The assumption that the fiction in the circulating libraries is bought largely to meet a feminine demand is made on the ground that among men the corresponding section does not read. At any rate, that section does not read novels in any voracious manner, the manner that must account alike for the large output from the press of bad books, the low rate of pay obtained by all but the best writers, and the obscurity of the work of those writers by masses of rubbish. There are certain sporting novels which some idle men read, whether their acquaintance with sport is first-hand or not. But even these are read with conscious

effort, and only when there is no other way of passing the time. Such readers look through the pages of their favorite authors as Gargery looked through the newspaper, picking out the methods of nobbling the favorite with the satisfaction enjoyed by that charming blacksmith when he spotted the 'Joes.' And some idle men read detective fiction, however drearily mechanical and stale it may be. But idle men, and men whose occupations are not intellectual, do not read novels voraciously. In the matter of novel reading it really seems to me that the attitude of men and women differs. Both among men and among women we find two fairly distinct classes above, say, the legitimate range of any National Insurance scheme. We have a class that is engaged in hard mental work (a class that might fairly be called intellectual) and a class made up of one section that may work for its living in a methodical manner, and of another section that does not work at all. Among the men who are not intellectually employed little fiction is read, and that of a trivial sort; and among the opposite class of women—those who are intellectually employed—very little fiction is read. Novels do not draw the attention of the latter away from their serious absorptions. Remain the intellectually employed man and the unintellectual woman as possible consumers of what the circulating library may have to offer. The unintellectual woman will swallow anything—she has been found to have this voracity, and the vast masses of rubbish that are printed for the use of circulating libraries convict her of it. Meantime little is done for the intellectual man—that is to say, if we allow that only a small percentage of the novels now written have any status in letters.

"The library and the smoking-room of certain London clubs contain in the late afternoon busy men relaxing, and some of these men try hard to read the novels that are provided for them by the circulating libraries. They may succeed with difficulty, and save where the author is one of a small group whom it is unnecessary to mention—for no one would write down exactly the same names—they prefer to fall back upon old favorites. This is, I think, a reproach to our story-writers of to-day. The women who in increasing numbers lead a life similar to that of busy men do not try to read novels. They have not as yet the same facility in unbending which men have learned to acquire; they spend their leisure in continuing to work—that is, in reading books containing the facts which they wish to acquire, the views which they wish to assimilate, and the theories which they wish to combat. I think it is bad for them to be so serious, and I think it hard on many men that, with all the will to let their minds be abstracted and their attentions rested by reading novels, so few novels should be provided of the right kind. By this I mean that there are so few simple tales well told, while the men who could write them will not do so. The fashion is not towards simplicity. The modern novel, when it is good, is too often an exercise in sociology.

"And so I come to my plea. Cannot more good writers, sound thinkers, and artistic observers have consideration for those who want to 'unbend over a novel'—I quote the phrase because I have seen it used as a text for a scornful tirade against a slack-backed class. I write as one of that class. My idea of what is much wanted is not primarily a work which will instruct, or widen sympathies, or move to better things. I ask that it should interest and amuse,



either detaching the mind from worries, or making pleasant company for those who feel lazy. If it will do the other famous things, why, so much the better. Thackeray and Dickens, Balzac and Scott, can be read for relaxation alone, although their position in literature is what it is; their works can be unbent over, although they are great masters of fiction, and in spite of the knowledge that the unbending process may lead to occasional lapses in our appreciation of the author's higher aims. Why should writers with less claim on our attention than these masters insist on trying to keep us in a strained attitude of respectful attention? I am wholly with those novelists who in their wide conception of their art consider that in the novel all themes may be discussed, but there are times when psychological subtleties or sociological conundrums do not appeal even to the most highly principled reader. Several of what may be termed our leading writers of fiction, being properly and nobly filled with other wishes than merely to amuse us, regard as a slight upon their art the desire of a reader to unbend over their books when there is nothing else more pressing to do. It is to be regretted that these leading writers have such fine and comfortable ideals of work, so that they are always inspired with the intent to instruct us or to make us sit up; and I believe that a good many publishers share this view. To unbend over a book exactly represents what a large class of readers want to do, and their gratitude to the author who gives them a story which neither irritates them by its absurdities nor hypnotizes them by its lofty aims or its psychological subtleties is deep.

"Why are they given so little to read? If it were possible to cross-examine the prominent publishers as to their probable attitude towards the author of a good, straightforward, sensational novel, thoroughly well planned and thoroughly well written, their answers would reveal them as not averse from risking the issue. And if, further, we spoke of the matter to the booksellers, it is probable that they would declare, one and all, that such a book would be an easy commodity to sell. And there is a large public ready to buy, who badly want good stories. If we have the wholesale and retail machinery ready to sell, and the market ready to buy, the fault of the non-supply must be with the producers.

"Our leading writers do not attempt the simple, sensational story; they do not try to give us anything of the thrill that we get when we take from our shelves '*Les Esclaves de Paris*,' '*Edwin Drood*,' '*Uncle Silas*,' or '*Foul Play*.' The feeling of these leading writers may be that the simple, sensational novel is in some way a trivial or inferior piece of work. They may believe that such productions appeal only in a vulgar way to an uncritical audience; that their author convicts himself of having low aims, and of being still in the 'fifties. They may think that the task of writing a simple, sensational story is too facile to be worth essaying—that laurels won in such a way are too cheap. But the mere fact that there are scores of abominably bad sensational novels written every year indicates that to write a good one is not an easy task. It is a task that is too hard for those who make a habit of essaying it, for they show in their accomplishment their inability to meet the strain upon their intellect. Having industry and inventiveness, these gentlemen and ladies can only fail time after time because they do not try in any definite way to write what it lies within their power to write. Feeling that they have no arts of description, no powers of suggestion,



and little knowledge of life upon which to depend, they serve up a hodge-podge of impossibilities and horrors in the hope that all the murders, abductions, arson, sorning and regrating will not be wasted, in the hope that some one terrific event will at least capture the attention of a reader. But upon many of us their primitive strategy is wasted, for these are not books that can be read by educated people. The fact that persons can be found to publish them need not prevent our leading writers from giving us, now and again, the old sort of sensational novel, part of whose charm lay in an excellent construction, while the possibilities of the plot were made the most of by due display of literary craft and acquaintance with affairs.

"Many of our daily papers now, both London and provincial, morning and evening, provide feuilletons which, I believe, are designed to meet exactly the wants of those who wish to unbend over a novel. But very few persons with any grasp upon life or manners can read these serials with pleasure. The authors I have in my mind never know the details of the life that they depict, or, if they do, they deliberately travesty them, believing that one of the essentials of the melodramatic tale is that nothing whatever should occur in it which could occur conceivably in the daily round. Sensational novels have fallen for their writing into the wrong hands, or rather they are written in a steadily increasing number upon the fundamentally erroneous idea that, given lots of tremendous happenings, commensurate thrills must follow. This is to forget that it is possible to enjoy a good book in more ways than one, and that a work distinguished for its language, its psychology, or its teaching may, incidentally or essentially, have a good story for which it can be read alone.

"It is the mistake of some of our best modern novelists to think that to tell a mere story is a cheap way of approaching the public. Let it be granted that the sensational novels of Wilkie Collins, say, of Gaboriau, are read mainly for their plots, and little for their elucidation of problems or even for their delineation of manners, it must still be remembered that many of the first novels in our language have good plots as well as other virtues which we expect in a great work of art. These novels may not in many instances be symmetrically constructed, but they have been written on a plan offering opportunities for developing situations.

"Take such a book as '*Tess of the D'Urbervilles*' and examine its plot carefully, and it will be seen to have all the elements which usually go to the writing of a sensational novel, as well as being a most painful and eloquent indictment of hypocrisy and smugness, and an exercise in English prose. No one would suggest that '*Tess of the D'Urbervilles*' is a typical sensational novel, but it can be read for its excellent plot when the heart or the reason is not prepared to argue about its higher qualities. It is a fair example of the thoroughly good book that can be enjoyed in other ways than one. Cannot more such books be written? In this request there is no expectation that many living writers will be able to work on the plane of Mr. Hardy, but while there is purpose enough and to spare in Mr. Hardy's relentless romance, the high reasons for writing '*Tess of the D'Urbervilles*' have not prevented him from telling a good story. '*Tono-Bungay*,' '*Lady Rose's Daughter*,' '*The Princess Casamassima*,' '*The Nebuly Coat*,' '*The Sinews of War*,' and '*The*

Secret Agent' are other admirable stories by well-known writers, where the story can be read for itself. Mr. Joseph Conrad's is a particularly good example, for here is a picturesque writer, who has set down for us in other works passionate passages in men's inmost lives and tremendous upheavals in Nature, turning from the recording of moral and oceanic typhoons and the describing of the indescribable, to write a detective story, and taking care to do it extremely well, with an ease that never degenerates into slovenliness. Of course, such a book is bound to delight those who love a novel for the sake of the story. The cry of many of us is for more, and I think it likely that if male and female voices were blended in the demand we should receive some satisfaction.

"Mr. Wells in a lecture which I read in *Le Temps* alluded incidentally to the kind of reader who desires to unbend over a novel, and was, I think, unduly severe upon what he termed the attitude of 'the weary Titan' towards fiction. He seemed to consider that if busy men asked to have a readable story supplied to them after a hard day's work they were demanding from the novelist the prostitution of his craft and the sacrifice of his ideals. I believe with Mr. Wells that there is no height of teaching, no depth of morality, which a splendid novel may not illustrate; but I see why such splendid novels can be good reading alike for those who desire the gravest qualities and for those who want merely a story. And so does Mr. Wells, who has such first-rate books to his credit. Suspense is a great element of interest in a story; one writer may create that element in connection with a trivial incident of behavior, when another introduces the usual episode of the vanished necklace or the inexplicable alibi. Why in each case should the story not be equally well told? Why should not the details in what is called the sensational novel be as accurate? Why should not the author's comments and reflections be equally illuminating? In real life necklaces are stolen and murders are committed; why should not the simpler story be told with equal expertness? Or, to put a question already implied—why should not our great novelists condescend, at any rate occasionally, to the simple tale, as their fore-runners have done?

"I believe the answer to this question may rest with that increasing class among us—the educated working women. If serious women insisted upon being supplied with readable novels—which they will not so long as they take no proper relaxation from their strenuous labors—the machine-made rubbish supplied by the circulating libraries would disappear; and such stories as 'The Woman in White' would again add a joy to life.

"A doctor, in accordance with the accepted routine of his calling, may recommend very small things for very big conditions. For a patient with integuments of waxy hue, swelling of ankles and eyelids, twitching muscles and chilly extremities, neuralgic pains and palpitations, insomnia and loss of business aptitude, a convenient formula may be pil. aloes c. ferro (B. P.). The doctor is not flip-pant in giving such advice; and he is only silly when he expects too much outcome from it. I do not think that a common demand for readable stories will settle sex questions. All that the over-worked man or woman can get from reading a novel—the right kind of novel—is pleasant relaxation, but the habit of taking pleasant relaxation may have great general results. Jaded men appear to use

novels in this way more than their sisters do, who should take example by Sarah Battle. She, after doing 'her business, her duty, the thing she came into the world to do . . . unbent her mind afterwards over a book.'

"A striking example has reached me in the last few days of the inestimable value of good stories to persons with tired intelligences. I have seen the diary of a naval officer who has been engaged since the outbreak of the war on very hard and harassing duties. The result was to leave him, during such free time as he could obtain, mentally, as well as physically, worn out. But he was able to revel in novel reading. I am certain that he read these books—works by Meredith, Conrad, Wells, and Birmingham, selected in a haphazard way—purely as a diversion, that the story was what he read them for, and that, through the medium of the story, he obtained precious relaxation of mental strain. But I am equally certain that this highly educated man would not have secured a similar valuable result from reading ill-written, ill-conceived sensation, although he was 'unbending over a novel.'

"I submit that it is not disrespectful to good novelists if we read their books casually; that the finest works of fiction can be read in that manner, uncritically, with the keenest enjoyment; that simple stories are only satisfactory when written by thoroughly expert hands, and should therefore be not beneath the consideration of the masters; and that we do not get a proper supply of simple stories."

P. S.



## ORIGINAL ARTICLES.

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### A FURTHER CLINICAL STUDY OF THE CONTRADICTIONARY FINDINGS IN THE WASSERMANN TEST.

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By ABR. L. WOLBARST, M. D., of New York.

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The purpose of this paper is to call attention again to a phase of the Wassermann reaction, which seems to have escaped the widespread consideration which its importance deserves. The writer refers to the fact that several serologists working simultaneously with the same blood serum, may and often do obtain contradictory results.

In a previous paper,<sup>1</sup> in a report covering 37 cases, the writer reported the following findings. The blood was taken simultaneously in two test-tubes, with these results: Total agreement of findings, 26 cases (70 per cent.); slight disagreement, 6 cases (16 per cent.); absolute contradictions, 5 cases (14 per cent.). It was therefore apparent that there is a liability of variation of 14 to 16 per cent., if more than one serologist reports on a serum.

In the present study, an attempt has been made to consider this phase of the Wassermann reaction in a larger number of cases, solely from the standpoint of the clinician, who is often called upon to make a diagnosis of syphilis or determine the therapeutic progress of his patients by means of this reaction. Consequently, it is considered immaterial as to which of the serologists is in accord with the clinical data; the important question to determine is, Do the serologists agree in their findings, and are their findings trustworthy?

Serologists themselves find this a very difficult question to answer satisfactorily. It is agreed by all serologists that, from a purely theoretical standpoint, disagreement of results ought to be impossible. Certainly luetic serum ought always to give a positive reaction, and non-luetic serum ought always to give a negative

reaction. This is elementary; but the fact remains that in actual practice such is not the case. In the hands of one serologist, a serum gives a strongly positive reaction, while another serologist, equally competent and reliable, may obtain a negative reaction with the same serum taken from the patient at the same moment. Which of the two is correct, no one can tell—least of all the physician who has called these serologists into the case to assist him in making his diagnosis in a doubtful case. In the circumstances, the clinician is after all thrown upon the clinical data of the case for his final diagnosis. When serologists disagree in this wise, the clinician is forced to make his diagnosis on the clinical findings, as though there were no such laboratory aid as the Wassermann reaction.

It is undeniable that the Wassermann reaction is an invaluable aid in the diagnosis and treatment of lues. It is equally undeniable that physicians have gone to extremes in their laudation of this test, with the result that they are leaning more and more upon the laboratory evidence than upon the clinical features of their cases, upon which they were wont to depend in the pre-Wassermann period. The diagnosis of syphilis is being made to-day in the laboratory in many cases, disregarding in a great measure the clinical data presented by the patient. For his part, the writer would have no hesitancy in accepting a laboratory diagnosis of lues in a doubtful case, if he could feel sure that the serologist was absolutely correct in his findings; but when it can be demonstrated that such laboratory diagnoses are far from correct, that they often contradict each other, and that there is no way of determining which of the results is the correct one, he confesses to an increasing lack of faith in the laboratory findings. As a result of the investigations which he has been making for the past three years, he feels justified in saying that our diagnosis of lues must still be made primarily on our clinical data, assisted as far as possible by the laboratory findings, giving only such weight to the latter as may appear to be proper, each case to be considered on its own merits.

The writer's personal experience in the study of these contradictions has been that in the presence of active lues, the Wassermann reaction is apt to be uniform in the hands of several serologists; in latent lues, however, or in cases which have been under treatment for some time, the contradictions are most frequently found. And it is in these obscure cases, cases without definite clinical data, that the Wassermann reaction ought to be most useful as a diagnostic factor. It is, therefore, of supreme importance to guard against the possibility of permitting faulty serologic data furnished by laboratory workers to influence us in our diagnosis in these obscure and doubtful cases. We should not for one moment forget that the laboratory report on a given serum in such a doubtful or obscure

case may be entirely at variance with the clinical history of the case; nor should we forget that there is a strong possibility that another serologist might give us a serologic opinion of a totally different character.

The views expressed in this paper are based on a careful study of 134 private cases. The conditions under which this study was made adhere as closely as possible to the conditions under which the average practitioner obtains his Wassermann tests. These conditions assume that the practitioner draws the blood in his office, and then sends the tube as quickly as is practicable to his favorite laboratory where the examination is made and a report sent back to the physician in a few days. This method has been followed strictly, for in no other manner could this study be properly instituted.

In the beginning of this study, the serum was sent to two laboratories simultaneously for examination. Forty-nine cases were thus tested. Since then, however, in 85 cases, the serum has been sent to three laboratories, each working independently of the others. The results will be tabulated and discussed below.

*Method of Examination.*—The blood was drawn through a sterile needle into three sterile test-tubes. Within a few hours, the tubes were delivered to the laboratories; at no time was a tube ever permitted to remain undelivered for more than six or seven hours, and during that period it was kept in an ice-chest.

*The Serologists.*—In order to understand properly the character of the work done in connection with these tests, the following data must be of interest:—

*Serologist A.*—In this laboratory nearly 20,000 tests were made in the year 1913, and approximately 40,000 tests were made during the year 1914. The work is done by specially trained laboratory assistants, who are not permitted to do independent work until they have worked in the laboratory at least six months. Titrations are made every day, and special care is taken to secure properly standardized reagents.

In this laboratory, the Wassermann technique is used, with two exceptions—(1) they use one-tenth the bulk of the original Wassermann test, making the total bulk of the test 0.5 c.cm. (this does not change the relative proportions in any way); (2) they bind complement for a period of four hours at ice-box temperature, instead of the usual one hour in incubator at 37° C. By this method, the serologist states that he has been enabled to obtain at least 10 per cent. more positive reactions in latent lues than by the original method. He also states that the additional 10 per cent. of positive reactions have been corroborated by the clinical histories, etc.



This laboratory furnishes the test-tubes for the collection of the serum. Having observed that the glass of the ordinary test-tube is alkaline in reaction, and that this alkalinity often has an anti-complementary effect on the serum, the test-tubes furnished are all boiled in 1 per cent. HCl solution, thus becoming neutral in reaction.

Serum sent to this laboratory is usually prepared on the day of arrival, and tested the following day, so that there is never more than twenty-four to forty-eight hours delay in examining the specimen. In the meantime the specimen is kept on ice.

*Serologist B.*—A well-known serologist, the author of a textbook on serology, who informs the writer that he has personally performed 50,000 Wasserman tests, of which 7,500 were spinal fluid. The technique he employs is that of Wassermann, as given by Citron in the *Handbuch fuer Immunitätsforschung*, except that he uses 4 units of amboceptor. This serologist believes that a positive Wassermann reaction is impossible in a patient who is clinically negative. When confronted, however, with the obvious fact that such serologic reports are very common, he declares that a positive reaction in a clinically negative case indicates a faulty technique, and consequently a wrong result. He aims to discourage, so to speak, the 'slightly positive' reaction. He reports 'strongly positive,' or 'negative.' There are no intermediate degrees in his work, unless especially requested by the clinician.

*Serologist C.*—A laboratory worker who has performed almost 8,500 tests, 2,500 of which were done in the year 1914. He employs the method of Wassermann and Citron, as being the most dependable and reliable. He is a careful and conscientious worker.

It must, therefore, be conceded that the three serologists who have been selected for this study have all had extensive experience; they follow Wassermann closely, and their results must be accepted as reflecting the general average of the work that is being done by competent serologists. Let us, therefore, compare the results obtained in their work with the Wassermann test.

In 85 cases, the serum was examined by these three serologists working independently. Of the 85 cases, the serologists agreed in 36 cases; they differed slightly in 16 cases, and absolute contradictions were obtained in 33 cases. By contradictions we mean those cases in which one serologist reports negative and another reports positive; where two report positive in varying degree, we have considered them as differences, and not as contradictions. The following table indicates the character and extent of these contradictions:—

## SHOWING DIVERSITY OF WASSERMANN REPORTS OF SERA EXAMINED SIMULTANEOUSLY BY THREE SEROLOGISTS.

Case Number	Serologist A	Serologist B	Serologist C
1 .....	4 plus	—	4 plus
2 .....	4 plus	—	4 plus
3 .....	3 plus	—	1 plus
4 (after provocative injection of neosalvarsan) ..	—	4 plus	—
5 (one month later, same patient) ..	—	4 plus	—
6 .....	2 plus	—	—
7 .....	1 plus	—	1 plus
8 .....	4 plus	—	plus minus
9 .....	4 plus	—	2 plus
10 .....	—	4 plus	1 plus
11 .....	3 plus	—	4 plus
12 .....	4 plus	—	4 plus
13 .....	4 plus	—	—
14 .....	—	4 plus	—
15 .....	—	—	1 plus
16 .....	2 plus	4 plus	—
17 .....	4 plus	—	3 plus
18 .....	4 plus	—	3 plus
19 .....	—	—	1 plus
20 .....	—	—	2 plus
21 .....	4 plus	—	—
22 .....	—	4 plus	—
23 .....	4 plus	—	4 plus
24 .....	4 plus	—	3 plus
25 .....	1 plus	—	—
26 .....	4 plus	4 plus	—
27 .....	3 plus	—	—
28 .....	4 plus	4 plus	—
29 .....	—	—	2 plus
30 .....	2 plus	—	—
31 .....	3 plus	—	—
32 .....	4 plus	4 plus	—
33 .....	2 plus	—	—

A review of the foregoing table will show the following interesting facts:—

In these 33 cases in which absolute contradictions were found,

- (a) Serologist A obtained 24 positives (73 per cent.) and 9 negatives (27 per cent.),  
 Serologist B obtained 9 positives (27 per cent.) and 24 negatives (73 per cent.),  
 Serologist C obtained 16 positives (50 per cent.) and 16 negatives (50 per cent.) and one plus minus.
- (b) Serologist A obtained 9 positives in sera declared negative by B and C,  
 Serologist B obtained 4 positives in sera declared negative by A and C,  
 Serologist C obtained 4 positives in sera declared negative by A and B.

- (c) Serologist B. obtained 12 negatives in sera declared positive by A and C,  
 Serologist C obtained 4 negatives in sera declared positive by A and B,  
 Serologist A did not obtain a single negative in serum declared positive by his colleagues.

What inference may we draw from these data?

- (a) Serologist A found 73 per cent. positives, 27 per cent. negatives,  
 Serologist B found 27 per cent. positives, 73 per cent. negatives,  
 Serologist C found 50 per cent. positives, 50 per cent. negatives

in the same serum. We are therefore forced to believe that Serologist A sought to 'bring out' the positives, that Serologist B sought to attain the exact opposite, and that Serologist C occupied the 'middle of the road.'

(b) Serologist A obtained 9 positives in sera declared negative by his colleagues, whereas Serologist B obtained but 4 and Serologist C also 4. This would confirm the tendency of Serologist A to 'bring out' his positives to an extraordinary degree.

(c) On the other hand, the tendency of Serologist B to 'bring out' the negatives is strongly emphasized by the fact that he obtained 12 negatives in sera declared by his colleagues to be positive; and here again it is to be noted that Serologist A did not obtain a single negative in serum declared positive by the other two. Here we see the personal equation as a strong factor in the Wassermann test. That is to say, a serologist may, if he chooses, obtain a preponderance of positives or of negatives in his work.

Taking up the 29 cases which were examined by two serologists, we find that they agreed in 32 cases (65 per cent.); differences were noted in 11 cases (23 per cent.), and absolute contradictions occurred in 6 cases (12 per cent.).

Comparing the two series of cases, we find the following interesting figures:—

Three serologists examining 85 cases:	Two serologists examining 49 cases:
Agreed in 42 per cent. of cases,	Agreed in 65 per cent. of cases,
Differed in 19 per cent. of cases,	Differed in 23 per cent.,
Contradicted in 39 per cent. of cases.	Contradicted in 12 per cent.

Before concluding these data, it has seemed pertinent to give the serologic history of 3 of the writer's patients who have patiently and conscientiously presented themselves from time to time for the serologic tests. The first patient, M. F., has had 10 tests made, with the following interesting results:—



<i>Date of Test</i>	<i>Serologist A</i>	<i>Serologist B</i>	<i>Serologist C</i>
November 7, 1912.....	4 plus	No test made	—
January 7, 1913.....	—	—	—
February 13, 1913....	2 plus	—	4 plus
April 1, 1913.....	4 plus	—	plus minus
July 9, 1913.....	4 plus	No test made	2 plus
August 21, 1913.....	plus minus	No test made	2 plus
October 4, 1913.....	1 plus	—	1 plus
December 18, 1913....	2 plus	—	—
February 6, 1914.....	2 plus	—	—
March 16, 1914.....	3 plus	—	1 plus

These data illustrate the futility of depending implicitly on the laboratory reports, considered as a diagnostic aid or as a therapeutic guide. During the period of sixteen months in which this patient was under observation (part of the time under treatment), ten tests were made, in six of which three serologists participated. In but a single instance did all three workers agree (all negative). Serologist A obtained a positive reaction 8 times, a negative once and a plus minus once; Serologist B obtained a negative reaction in the 7 tests in which he participated; while Serologist C obtained 5 positives, 4 negatives and one plus minus. Is it not fair to ask, Which of these serologists was correct in his findings, and why did not all three get the same results? Surely a serum cannot be positive and negative at the same moment!

The second patient, G. M., had five tests made, as follows:—

<i>Date of Test</i>	<i>Serologist A</i>	<i>Serologist B</i>	<i>Serologist C</i>
February 24, 1913....	—	—	—
September 27, 1913...	—	—	—
February 3, 1914.....	—	—	—

Provocative injection of neosalvarsan administered February 5, 1914.

February 23, 1914....	—	4 plus	—
March 20, 1914.....	—	4 plus	—

In this series of tests it will be observed that the patient was reported serologically negative three times by all three serologists. A provocative injection of neosalvarsan, however, resulted in two successive 4 plus reports by Serologist B, whereas both A and C reported negative as before the injection. How are these contradictions to be explained?

The third patient, R. E., had seven tests made, with these results:—

<i>Date of Test</i>	<i>Serologist A</i>	<i>Serologist B</i>	<i>Serologist C</i>
January 31, 1914.....	3 plus	—	4 plus
April 4, 1914.....	4 plus	4 plus	3 plus
April 24, 1914.....	3 plus	4 plus	3 plus
May 21, 1914.....	4 plus	—	3 plus
June 23, 1914.....	4 plus	4 plus	2 plus
September 4, 1914....	4 plus	4 plus	4 plus
October 9, 1914.....	4 plus	4 plus	4 plus

This patient, therefore, had seven tests, and of this number there were two flat contradictions (tests Nos. 1 and 4). He was under treatment with salvarsan, mercury and iodides during most of this period, and though he was clinically well, his treatment had no appreciable effect on the Wassermann reaction, except perhaps to make it more strongly positive as the treatment was increased in intensity.

In reporting an instance of faulty positive Wassermann reaction in a young woman without clinical history or evidence of lues, Pusey<sup>2</sup> says: "The greatest fault is carelessness in technique. Another source of error is old blood. Blood two days old, even when kept in an ice-box, is unreliable for the test; and much more so, if it has been kept at car temperature whilst in transit to a distant laboratory. Finally, some careful and conscientious but over-zealous workers are drawing their test so fine in order to increase its sensitiveness that their readings sometimes become unreliable.

"This criticism is not directed against the Wassermann as a test. The Wassermann is all right, but it should be appreciated that it is open to error in manipulation. It is not final and unimpeachable evidence, and in improbable cases, like the one mentioned, a positive reaction should not be accepted unless one can be perfectly sure of the reliability of the process by which it has been obtained. The tendency to accept the result of a test as infallible is the old story of allowing too much weight to laboratory findings—as though they were above the common human frailty of error. The Wassermann reaction is but one fact in the diagnosis of syphilis. It should be confirmed by other diagnostic evidence. In the very rare absence of this, it is not too much caution to have two independent tests to check each other."

Within the past year, the writer encountered a striking case somewhat similar to that reported by Pusey. The patient was a young woman, a nurse in a large hospital in the Panama Canal Zone. She was perfectly well. One day in a spirit of fun, she permitted one of the house staff to draw some of her blood for a Wassermann test. The report came back several weeks later, '4 plus.' Thoroughly frightened, she sought advice from the physician in charge, and he acting on the laboratory report and disregarding

her perfect health and negative clinical history, at once advised strong antisyphilitic treatment. This was administered for several months. At that time, having been salivated and rendered ill by the enormous amounts of mercury she was taking, she consulted the writer about her case. All medication was ordered stopped for three months, and thorough elimination of the drug was resorted to. After three months she presented herself for observation. She was much improved physically, but suffered from severe mental depression as a result of the thought that she might be syphilitic, as her physician thought. The writer drew blood in three sterile tubes, and three independent serologists reported negative unanimously. A month later, three serologists again rendered a unanimous negative report. The writer is convinced that this woman, with a negative clinical history and in absolutely perfect health, suffered a great injustice when she was declared syphilitic on the strength of a laboratory report. Such a diagnosis was absolutely unjustifiable, to use a mild term. The clinician has no right, in any circumstances, to make a diagnosis of lues simply because a laboratory reports a positive Wassermann reaction.

Not only is the serologist liable to err, but the clerical conditions under which the report is written may also be the source of error. In the writer's experience, he has encountered an instance in which a serum was examined in a large hospital in this city. The serologist is recognized as a competent and careful worker. The report sent down from his laboratory was positive. The case appearing to be clinically and historically negative, the writer mentioned the apparent contradiction to the clerk in charge, and he told the writer with some sign of surprise that he had made an error in writing out the report. The report should have read 'negative,' and to confirm his statement he showed the writer the entry 'negative,' in the laboratory record book. Now, if it is so easy for a clerk in a large hospital to change a 'negative' into a 'positive,' simply through a clerical error, it naturally follows that such an error is likely to occur in any laboratory at any time. The possibility of error is a strong factor in this work, and this feature must never be lost sight of in accepting laboratory reports, particularly in doubtful cases.

From the serologists themselves very little encouragement can be obtained. All are agreed that the present status of the Wassermann test is unsatisfactory owing to the fact that there is no uniformity or standard in the reagents employed or in the technique. It seems to be the unanimous opinion of the experts whom the writer has consulted, that these unsatisfactory conditions will obtain until some system has been adopted whereby all reagents used will have been standardized and the technique perfected so that all serologists shall use the same methods. 'Faulty technique' is un-



doubtedly the cause, but there is a wide divergence of opinion as to what constitutes faulty technique; and the writer has not yet met the serologist who is willing to admit that *his* technique is anything but perfect.

As a matter of interest, the writer has obtained the views of a number of this city's best-known serologists, in the hope of getting at the bottom of this intolerable situation. With their permission, they may be quoted as follows:—

Dr. F. E. Sondern: "Assuming that the different serologists have proper education and experience, and surround their work with proper safeguards, I see no reason why results should vary materially. While it may be a strange coincidence, I know several workers whose results with the same serum never differ except perhaps to a slight degree in doubtful or weakly positive reactions, and they do not use the same antigens. There is certainly no excuse for different results by one worker on the same serum."

Dr. T. W. Hastings: "We have frequently observed that the results of Wassermann tests from different laboratories are contradictory, and in investigating the matter have found that it is mainly due to the fact that the laboratories at large have not the facilities, nor do they take the pains to properly standardize every few days the solutions, as antigens, hemolytic amboceptors and complements, which are necessary for perfect tests. These variations can be avoided only by insisting that those who make the tests shall be thoroughly trained in the immunizing of rabbits for the hemolytic amboceptor, in preparing and testing out antigens, and in proper testing of complement. Most of the instances which have come to our attention have resulted from the fact that the man who made the test mixed together four solutions in a test-tube, not realizing that this is one part of the work that can be done by a 'Diener' or a well-trained laboratory janitor."

Dr. D. M. Kaplan: "The reasons for these discrepancies are

1. Insufficient criticism in reading end-results.
2. Biased (subconscious) rendition of results from a previous knowledge.
3. Insufficient care in standardization.
4. Too many positive results from using only two units of amboceptor.
5. Using modifications instead of the original reaction."

Dr. J. J. Hertz: "The sole cause of the variations lies in the different antigens employed. Some serologists titrate their antigen for one-half or a full hour, and then do not take readings for four or five hours or even the entire following day. I believe, in this way, weakly positive sera are interpreted as negative. Then again, in titrating the antigen, the difference between the smallest amount of antigen necessary to make a positive serum positive, and the

amount which will make a negative serum positive, is so small that it will deteriorate in a few days and give a wrong result. I believe that all reagents should be titrated every time the tests are done. In order to avoid these discrepancies, I believe that all the serologists should get together and decide upon the best kind of antigen to be used, and have a central body prepare the same. Personally, I think that the Noguchi acetone insoluble lipid antigen or the original Wassermann antigen is the best."

Dr. M. F. Schlesinger: "Over-confidence and resulting carelessness may prompt the technician to do careless work. All reagents must be titrated against known sera before beginning the test. Feeding of the guinea-pig may change the complementary value of the serum, and it should be titrated each and every time. Dirty tubes and pipettes inhibit hemolysis. One drop of water will hemolyze the blood-cells. Working with an amboceptor that gives high value, say 1:2000, the smallest excess will make a positive reaction turn negative. The most common mistake is to take one pipette and use it throughout the reaction for as many tests as there may be. A different pipette should be used for each serum. I have intentionally mixed two or more negative sera and obtained because of this a positive reaction. The saline solution used for the test should be freshly prepared and from distilled water. Another mistake consists in making too concentrated an emulsion of sheep cells. A negative reaction will thus be made positive."

A review of the literature indicates that not much attention has been given to this subject. In the German literature the writer has found these references: Freudenberg<sup>3</sup> reported 2 cases of contradictory results in the same serum. In the discussion which followed, Muehsam stated that he believed the faults are due to the different ways in which the reagents are prepared. Michaelis believed that the determination of a positive or a negative reaction was largely a matter of individual opinion. Lesser thought that those cases in which contradictory results appear, must be considered as luetic. Blaschko believed that only strongly positive reactions should be considered as of value. Wassermann was of the opinion that none but his own original method was correct; in 1,000 cases examined by him there was no error, and the same was true of cases studied in Ehrlich's Institute. He also recommended that antigen be prepared and distributed at some central station. Wossidlo spoke of 20 cases which were studied in seven different serologic institutes in Berlin. Of these, 7 agreed and 13 disagreed. In 6 nonluetie cases, 4 agreed and 2 disagreed; in 11 luetic cases, only 3 reports agreed. He urged the use of three different extracts, and methods that are not too fine and sensitive. At least two serologists should have the same result; otherwise he disregards it as incorrect. The reaction should be considered as positive the first time,

only when hemolysis is complete or nearly so. Sera obtained from persons suffering from fever should not be examined for the reaction.

Saalfeld<sup>4</sup> also urged that the necessary reagents required for the Wassermann reaction should be prepared and distributed at a central station.

Wesener<sup>5</sup> studied 249 cases in various institutions; he obtained disagreement in results in 18 per cent., and absolute contradiction in 9.6 per cent. of cases. Meirowsky<sup>6</sup> discussed this phenomenon under the title "Sera Paradoxa." The subject was also considered by Stern, Rasp, Sonntag, Ritz, Sachs and others.

Gratz<sup>7</sup> believes that the term 'reaktion paradoxa' is more nearly correct than 'sera paradoxa,' indicating his belief in the fallibility of the reaction rather than any inherent quality of serum itself. Altmann<sup>8</sup> discussed the influence of the temperature upon the results of the Wassermann test.

Speaking of contradictory findings in the Wassermann test, Gottheil<sup>9</sup> says: "One examiner may use only the older and rougher methods; another may employ the very latest antigens; while a third may use a special method that is all his own. So that now we get reports like this: Negative to the ordinary antigens, weakly positive to highly sensitized or to cholesterin antigens. A patient with such a report would get a simple negative one from an examiner using only the routine methods, or from one of the many drug-stores and other uncontrolled places where the test is so frequently made. Finally, each examiner has his own method of recording results; and I have frequently been unable to make any satisfactory comparison between reports made by different persons on the same patient."

The possibility and danger of imposing a conviction of syphilis on an innocent person by a faulty laboratory diagnosis is well stated by Thomas and Ivy<sup>10</sup> in these words: "Considerable harm is being done at the present time by the use of unreliable non-specific or artificial extracts, in two ways: (1) The marked discrepancies between the results of the Wassermann test and the clinical findings in many cases are causing sceptical clinicians to lose confidence in the value of the reaction, and thus they are being deprived of an important diagnostic and therapeutic aid; (2) a great many unfortunate people are being treated for syphilis who have not and who never had syphilis, as the result of weakly positive and doubtful reports by workers using these antigens. It seems to the writers that there should be some means of cooperation of Wassermann workers for standardization and uniformity of methods, to be adhered to as long as they are justified by clinical results, with the acceptance from time to time of such advances in technique as may



be approved. In this way only will the serological syphilis reaction retain the confidence that its intrinsic value permits."

In a carefully prepared article, Stone<sup>11</sup> discusses the sources of error in the Wassermann technique. His tabulation, giving forty-three independent possible sources of error, shows clearly that present methods do not permit of uniform reliability. He believes that the tendency is to err on the side of positive results. In other words, "many workers apparently labor under the delusion that if an individual applies for a complement fixation test, that person must have syphilis, and every effort is directed toward obtaining serological proof." This tendency is well shown in the reports furnished by Laboratory A, the head of which, by modifying the original Wassermann technique slightly, has been enabled to obtain at least 10 per cent. more positive reactions in latent (?) lues than by the original method (*vide supra*).

In view of these observations and opinions, combined with the data which the writer has gathered, what position shall we take in this matter? What shall we tell our patients when they come to us for definite information?

The writer believes that in all cases our patients should be informed of the liability of human error and fallibility of the Wassermann test; they should be made acquainted with the fact that a single laboratory report is not to be accepted as conclusive; that such a report is, after all, merely the opinion of the man who made the test, based on the employment of certain reagents made and chosen by himself; that another serologist, using the same or other reagents, might obtain a totally different reaction, and that we are not in a position to say which of the two is correct. The best thing we can do to conserve the interests of our patient is to submit the serum to at least three serologists simultaneously; these serologists to be chosen for their known probity, learning and conscientious work, in the same manner as we should select a consultant in any other field of medicine. In view of what we have seen, it is reasonable to expect that these independent serologists will differ in their findings in about 20 to 30 per cent. of our cases. Consequently we must prepare our patients for this contingency.

When independent serologists agree, surely we have a right to accept their reports as correct; upon such unanimous findings we have the right to base our diagnosis and determine our therapeutics. But when they disagree, we are thrown upon our own judgment.

#### CONCLUSIONS.

1. Three serologists working independently, tested sera simultaneously in 85 cases; they agreed in 42 per cent., differed more or less in 19 per cent., and there were gross contradictions in 39 per cent. of the cases. Two serologists, working independently and

simultaneously, examined sera in 49 cases; they agreed in 65 per cent., differed in 23 per cent., and there were gross contradictions in 12 per cent. of the cases.

2. The Wassermann reaction is dependent for its result on the skill and knowledge of the serologist.

3. The results of the test depend in great measure on the absolutely perfect standardization of the reagents used; these are subject to variation in the hands of different serologists.

4. As a result of these differences, diversity in results is not infrequent.

5. It is a gross error to accept the findings of one serologist as conclusive; his work should be checked up by one or more equally competent workers.

6. If two or more competent serologists report on a given serum, the majority opinion may be accepted as fairly conclusive; frequent reexaminations are always of advantage to the patient.

7. All mention of results of the Wassermann test, in the literature or elsewhere, should be accompanied by the name of the serologist who made the test, in order that the measure of accuracy and skill employed may be estimated.

8. The serologist should be selected with the same care and caution as is exercised in the selection of a consultant or expert in any other branch of medical science.

9. *Remedies Proposed.*—Reagents should be prepared and distributed at a central station (Board of Health, for example); all workers should adopt a uniform, recognized method, which has been found trustworthy and reliable; meanwhile, Wassermann reports should be accompanied by the name of the individual worker who made the test, together with a brief statement showing the method, apparatus and reagents used. In this way only can we determine the degree of confidence to place in the reports handed to us by serologists.

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A LECTURE ON THE SANATORIUM TREATMENT OF  
PULMONARY TUBERCULOSIS.\*

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It seems that many people do not understand what sanatorium treatment is, what it consists of, and what advantages it affords the patient. Before we proceed further, let me give you a definition of the word sanatorium and the distinction between sanatorium and sanitarium. Dr. S. Adolphus Knopf in his International Prize Essay on Tuberculosis uses sanatorium in preference to 'sanitarium' for the following reasons: Brehmer, the founder of the first institution of that kind, called it *Heilanstalt*, which means a healing institution; and the word 'sanatorium,' from the Latin *sanare*, to heal, certainly gives a better equivalent to the German word than the word 'sanitarium.' This latter word is derived from the Latin *sanitas*, health, and is usually employed in this country to designate a place considered as especially healthful, a favorite resort for convalescent patients, or an institution for the treatment of mental or nervous diseases.

Now I trust it will be worth your while if I present a brief outline describing the course of treatment available for the usual patient upon his admission to the sanatorium.

In the first place he is carefully examined by the physician, and an intimate and confidential history is taken which relates to his occupation, former sicknesses, habits, heredity, and his present illness, leading up to the time of his entering the sanatorium.

No matter what his condition may be, he is immediately put to bed for an observational period. This meets with strenuous protest on the part of many a patient. He may insist that he has never been kept in bed on account of his illness; he does not understand why he cannot stay up, dressed and allowed to do as he pleases. Usually such a patient is more amenable to the rest treatment after the physician has carefully and kindly explained to him the significance of remaining at rest in bed until certain unfavorable signs of disease activity can be ruled out of his case. We find that the average patient is very grateful for such explanatory advice, and will admit that he has been in ignorance of the proper method of taking sanatorium treatment; especially is this true if the patient

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comes in with the statement common to many cases, that is, he "stopped work from three to six months previous to admission and has since been taking treatment at home." Upon analysis of his manner of taking home treatment we find that, for instance, he would arise every morning at a fairly early hour, and, after a more or less irregular meal, would take a walk down town, stand around on the street corner a while, perhaps visit some friends or kill time somewhere, returning home in the afternoon tired and flushed with fever. After a rest he would perhaps go out for a walk in the evening. In spite of his taking ten or a dozen eggs daily he found that he was always losing weight, cough was racking and exhausting, and his stomach out of order.

This is a fair example of the usual failure of taking treatment at home. Of course, there are many exceptions to the rule, but even so, what the average patient needs is to be kindly but firmly directed just what he must do and what he cannot do. If left to himself to work out his own salvation, the course of treatment adopted is analogous to a rudderless boat in a heavy sea.

Now give this patient a week's absolute rest in bed under sanatorium restrictions and the change for the better is extraordinary. He looks and feels 100 per cent. better; he finds his many troubles diminished in number and severity, and, for the first time perhaps in many months, the progressive emaciation is stopped and he begins to gain weight and strength. Even aside from all discussion of his possible chances for ultimate recovery, he is relieved of an immense amount of suffering by this treatment.

If the patient is unwilling or shows disinclination to follow the treatment prescribed, we tell him that he still has the advantages of a consumptive home and so long as he obeys the general rules of the institution he can run his own case as he sees fit. I have seen some consumptive individuals, to whom every opportunity possible was given to recover their health, nevertheless throw aside these chances and sink into the rut of protracted invalidism. These individuals sooner or later help to swell a mortality report. However, they must be made comfortable in the meantime; they must be cared for in an institution; and they are entitled to almost every consideration as men sickened in body and mind alike. For imagine yourself stricken with a lethal disease, out of work, deprived of the healthy influence of regular employment and required to face day after day enforced idleness, watching encroaching disease prey upon you. Then you have the point of view of the progressive consumptive and you do not wonder that his attitude is one of futility.

But to resume the course of the patient in the sanatorium, let us take, for example, the case of a patient who is amenable to treatment and in whom the disease has not yet advanced to a hopeless stage. During the first week's residence, we find out all possible

information relating to his case, by observation of temperature, pulse and respiration taken twice daily, the condition of his appetite and digestion, cough and so forth, and by laboratory examinations of specimens. He is usually at rest in bed during this period, and under this treatment whatever disease activity was present at admission may now disappear. The patient receives extra nourishment in the way of raw eggs if his digestive apparatus can accommodate it, but there is no sense in stuffing and overfeeding an individual whose stomach is suffering from the toxemia of the disease, for it is but throwing an extra burden upon a weakened organ which is only able to assimilate a minimum amount of nourishment.

With such a patient, treatment is a matter of giving the entire body rest so that the disease may quiet down and the toxemia be less intense. The effect of exercise upon the active disease process in a tubercular patient appears similar to that of fanning a glowing spark into flame—the more bodily activity the faster the disease spreads. Therefore, that which is a small effort for a healthy individual becomes dangerous exertion for a tubercular patient with active disease. The balance of metabolism, *i. e.*, the building up and tearing down of body tissues is somehow upset so that the tearing down process, which in health should be no greater than the building up process, far exceeds the latter. As I have just mentioned, assimilation of food and the building up process of body tissues may be hindered by the disease poisons, so it seems better to prevent, as much as possible, excess of the tearing down process; and for these two reasons we prefer to treat the patient, who shows active disease and emaciation, by absolute rest in bed rather than by superalimentation plus nonconsideration of his exercise. We want to get him in such a condition that he can take, relish and digest three square meals daily.

If this patient has a fair resistance to the disease, he will respond to rest treatment by gaining weight and becoming free from signs of disease activity. Then he is promoted, so to speak, from a ward to an ambulatory case and is up and dressed daily, living on one of the open pavilions. Then another problem arises—namely, to provide this man with some sort of light occupation and daily duties so that we can test his resistance to the disease, and so that the horrible bugbear of enforced idleness may not work its bad effects upon this patient.

The man is able to take exercise and now needs it, for the disease has appeared to lapse into quiescence, and the equilibrium of metabolism is evidently restored for the time being. If the patient continues to improve, and shows no reaction of disease activity while subject to exercise, the latter may be increased up to three or four hours daily.

Many patients are able to work up gradually to a number of hours of daily exercise and show a steady improvement in general condition at the same time. It must be remembered that these patients have got the better of the disease to such an extent that no unfavorable symptoms are apparent. There is a sharp distinction between the active and the quiescent case of tuberculosis which must be borne in mind by one who attempts to treat the disease. For failure to appreciate the signs of activity results in much discomfiture and loss to the patient.

By physical examination of the lungs and examination of the sputum, we are enabled to get a line on the state of affairs in the actual disease focus. The healing of a tubercular lung so that it no longer floods the body circulation with poisons and no longer discharges tubercle bacilli is the object sought. Some patients in the early stage achieve this success in five or six months of sanatorium residence. Others need a year or eighteen months' treatment before they can be called arrested cases.

Still other patients seem to reach a certain level of improvement where the disease is quiescent and where they are able to feel well and to live on indefinitely under sanatorium restrictions; yet these patients are hardly able to undertake outside occupation without serious danger of breaking down again.

Naturally, they finally become tired of the continued institutional routine, insisting on going home. They are discharged against advice and are apt to lose whatever improvement they have made at the sanatorium, again becoming chronic invalids.

This class of ex-patients is no doubt well known to the representatives of your society for they must constitute one of your big problems. It seems as though they should be cared for in some local institution where they may be near their relatives and friends, and more contented.

Then another problem is that of the man who takes treatment on the 'instalment plan' running out and in the sanatoria—a restless, discontented individual inside the hospital and a distributor of deadly infection on the outside.

There is one way in particular by which an anti-tuberculosis society can cooperate with the institution, and that is by relieving the patient's mind of many of the trivial worries about his home condition. Many patients come to us leaving families at home about whom they are continually worrying. Oftentimes a serious obstacle in the way of a patient's improvement is his continued worrying about how the folk are getting along at home. No doubt there are many instances of hardship undergone by the family deprived of the bread-earning member, and I appreciate your difficulties in handling this great problem. Sometimes their worries are greatly



exaggerated and may simmer down to nothing when someone investigating the real home conditions assures the patient that all is well.

In discussing the family problem as how to care for the family members at home while the breadwinning member is taking treatment at a sanatorium, it is important to remember that you have, in this family, people susceptible to the disease and also already exposed to infection. Therefore, they need the good food, fresh air, and careful watching as much as the sick member, for we all know that an ounce of prevention is worth pounds of cure.

I hope some day to see a national insurance act with funds available for this very purpose. Many local boards now pay pensions to the widows and families who have lost their wage-earners. But why wait until they are dead when poverty may already have made its deadly inroads into the health of the family? A chronically ill man has no earning capacity and will never have again.

The matter of education is an important element in the sanatorium treatment. Lectures are given on hygiene and prophylaxis pertaining not only to the care of the individual patient, but to his conduct in his own home against further family infection. It is through the family clusters that tuberculosis makes its greatest headway, no doubt due to the close seclusion of the tubercular and healthy members alike, to say nothing of an inherent disposition to take the disease.

Patients are taught to cover their mouths with handkerchiefs or paper napkins when coughing in order that the droplets of sputum which probably carry tubercle bacilli may not fly into the room to infect healthy people. We read more and more of the significance of droplet infection, and accordingly we believe that these instructions and enforced practice of patients will have its good effect when the patient goes home.

Patients are very much interested in listening to explanations regarding the disease and its various features and also to accompanying demonstrations at our laboratory; so that the physicians always feel well repaid by the ready interest taken in these subjects.

In regard to medical treatment, we give as little medicine as is consistent with the patient's comfort. Rest in bed is such a panacea that it is better to use this harmless remedy than drugs.

It is remarkable how well patients can get along without alcoholic stimulants, including even those patients who were always badly addicted to the use of liquor.

Some men prescribe alcohol as a routine in the treatment of tuberculosis. However, our wards, I know for an absolute fact, are far better off in every way if not a drop of spirituous liquor is used.

An account of sanatorium treatment of tuberculosis would be

quite incomplete without mention of the matter of amusements and entertainments. As I have already called to your attention we have a large body of patients deprived of the healthy influence of work. Their minds must be at least partially occupied while their bodies are getting the effect of rest treatment, for an idle mind is prone to deteriorate and to incubate vicious ideas.

Aside from the little daily duties which we try to provide for each patient able to take exercise, there must be amusements. There must be some entertainment of a pleasing nature to take the patient's mind, at least for the time being, off the fact that he is a patient. Accordingly, we try to provide, as often as is possible, some little musical program for an evening, a play, moving picture shows and so forth. We have a kinetoscope and we run new films at regular intervals, which makes a very popular evening entertainment. This machine can be set up in the wards so that the bed patients are provided for.

It is surprising how little coughing is heard throughout an evening's entertainment at the sanatorium. You would never suspect from the appearances that you were before an audience of people afflicted with pulmonary trouble.

We feel that the educational side of the tuberculosis problem still has great possibilities and we wish to do all possible on our part to impart sensible information regarding this disease to the public.

COCCOBACILLUS FÆTIDUS OZÆNÆ PEREZ VACCINE IN  
THE TREATMENT OF OZENA.

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By LOUIS K. GUGGENHEIM, M. D., of St. Louis.

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(With a Preliminary Laboratory Report by Charles L. Klenk, M. D.,  
of St. Louis.)

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For years ozena has been the subject of much speculation as well as of interesting experimentation. The condition may briefly be described as an affection of the nose, which is characterized by an atrophic process combined with the formation of yellowish-green crusts, and the production of an indescribably horrible fetor. Pharyngitis sicca always, laryngitis sicca sometimes complicates ozena. Another possible result of the affection is the so-called saddle-nose. It is unnecessary to go into detail concerning the general symptoms, such as loss of appetite and weight, sickly appearance, etc. The question of importance is, Are these symptoms specific for ozena? Atrophic conditions of the nose occur in lues, rhinitis atrophicans simplex, etc. The formation of crusts is the result of the drying of secretion in the enlarged nasal cavities and of the actual changes in the moisture-producing elements of the mucosa. In the early stages of ozena before the atrophic process has progressed very far, there may be no crust formation. Hofer has demonstrated the Perez organism in such cases. The combination of the characteristic fetor with the crust formation may be considered specific for ozena. Crust formation combined with different types of fetor than that of ozena may often be observed in other conditions of the nose and of the nasal accessory sinuses. A case of tracheal ozena in which the nose, nasopharynx, oropharynx, hypopharynx, and larynx (down to the cords) were normal has been reported by Zarniko.<sup>1</sup>

Lues and tuberculosis have both been suggested as causes of the condition. Accessory sinus empyema has been blamed. In addition to these, numerous 'specific' bacteria have been described. Among these may be mentioned the *B. mucosus ozænæ* of Abel and Læwenberg, which is always found in the nasal secretions of ozena cases and is identical with the bacillus of sclerom described by Frisch; the pseudo-diphtheria bacillus of Della Vedova and Belfranti; a small, not definitely described organism found by Pes and Gradenigo; and a bacillus fœtidus of Hajek. The above investigators have, according to Hofer, based their conclusions more upon



speculation than upon experimentation. To give in detail the opinions of Zarniko, Hajek, Gruenwald, Schmidt, Lack, and others, concerning the etiology of ozena would be a waste of time in view of Hofer's findings. Of the former investigators, the one is certain that accessory sinus disease is the cause of ozena, the other has his favorite bacterium, etc. etc.

It remained for a physician-diplomat—namely, the present ambassador from the Argentine Republic to Austria, to find the true cause of ozena. Thirteen years ago, while experimenting with cultures made from the nose of an individual suffering with ozena, Perez noticed upon an agar plate a small colony which had the typical odor of ozena. This colony proved to be a pure culture of the coccobacillus of ozena. The Perez coccobacilli are polymorphous. Some are quite short and thick, others long, etc. Because of this polymorphous nature they are difficult of diagnosis microscopically.

In 1913 Perez asked Hofer of the "Universitaetsinstitut fuer allgemeine und experimentelle Pathologie" in Vienna, to prove the truth of his ozena investigations by experimenting with modern bacteriological methods. Hofer<sup>2</sup> has succeeded in proving that the findings of Perez are correct; that is that the coccobacillus isolated and described by Perez thirteen years ago is the true cause of ozena.

Concerning the isolation of the coccobacillus, Hofer<sup>3</sup> writes as follows: "The isolation of the coccobacillus foetidus ozænæ requires of one, not entirely familiar with the special conditions in the case of this disease, the greatest patience and exactness. The methods used by Perez thirteen years ago to identify a pure culture would not be considered flawless to-day. The problem is made more difficult by the fact that in the secretion from the nose of an ozena patient there are myriads of bacteria, so that in artificial growth one observes totally different cultures upon different kinds of media where the same secretion has been used for all." As a result of this, Hofer continues: "I isolated in the course of several weeks a large number of pure cultures from the secretion of an ozena patient without being certain of having isolated the desired coccobacillus of Perez. I now made use of a rabbit to accomplish the isolation. A portion of a bouillon mixed culture, which had the characteristic feter, was injected into a vein in the ear of a rabbit. After several days the rabbit developed a purulent nasal discharge in which I found what proved to be a pure culture of the coccobacillus Perez. By means of the rabbit's serum an identification of the Perez cultures, among the numerous pure cultures previously made, was made possible by agglutination tests."

Concerning the specific localization of the coccobacillus upon the nasal mucosa of the rabbit after intravenous injection and con-

cerning the specific action of the coccobacillus in this region, the following experiment was performed. The noses of rabbits were examined and pure cultures were made of the different bacteria. These cultures and a culture of the Perez organism were injected intravenously into different rabbits. After twelve hours, in the rabbits injected with the coccobacillus, the bacteria were found in the nasal secretion. This did not occur with the other bacteria. In addition to this specific localization, the results of an intravenous injection of a pure culture of the coccobacillus Perez into rabbits are as follows. After large doses the animals die within twenty-four to forty-eight hours. *Post-mortem findings:* Turbinates hemorrhagic and swollen. Slight enlargement of spleen. After smaller doses one observes, after a few days, a copious purulent nasal discharge. In the course of a few weeks this is followed by atrophy of the turbinates. Different cultures act with different degrees of virulence. Twenty per cent. of Hofer's cultures caused atrophy, all caused the hemorrhagic condition. The atrophic tissues show no pus cavities, but rather a diffuse purulent infiltration. The soft tissues and bone both show atrophic changes. Following the injection of the Abel-Løwenberg organism, no change occurs in the rabbit's nose.

By means of further experimentation Hofer proved that the Perez bacterium produces a soluble toxin which has the same selective effect upon the nose of the rabbit as the bacterium itself. The cultural fetor described by Perez is found in every pure culture and in every mixed culture containing the Perez organism. This fetor is identical with the fetor of ozena. The different strains of the coccobacillus Perez act differently in regard to fetor. Some lose the odor immediately upon being brought into pure culture; others retain the fetor after a second culture is made and then gradually lose it. The addition of albumin to the medium increases the fetor.

*Vaccination.*—Hofer, with the assistance of Kofler of the Chiari clinic, Vienna, is carrying out extensive tests with the vaccine treatment of ozena.<sup>4</sup> No case is accepted for treatment until accessory sinus disease has been excluded, and until a negative Wassermann has been obtained. Before the injection of vaccine is made, the patient's nose, nasopharynx, oropharynx, and larynx are examined by Kofler. The findings, including the degree of fetor present, nature and amount of nasal secretion, nature and amount of crust formation, condition of the nasal mucosa, degree of atrophy, condition of the skin about the anterior nares, condition of the mucosa of the nasopharynx, oropharynx and larynx, general condition of patient, opinion of members of family as to amount of fetor noticed, subjective symptoms, etc. are dictated to Hofer who keeps an accurate record of each case. The vaccine is administered in the fol-

lowing amounts: the first dose consists of fifty million bacteria or a somewhat smaller dose in selected cases. A reaction should manifest itself about twelve hours after the injection. If no reaction is noted, the next dose in eight days is one hundred million. If a reaction is noted, the same dose is repeated. The patient is told to return again in eight days. If there has been a reaction, the same dose is repeated, if not it is increased again. This method is continued until the patient has received the maximum dose of five hundred million bacteria. In some cases no more than three hundred to three hundred and fifty million are given.

After all fetor and practically all crust formation have disappeared, the last dose is repeated in two weeks. Three weeks following this, the same dose is given. After an interval of four weeks, the same dose is again repeated, etc. After the six weeks' interval dose has been given, the patient is permitted to go without treatment for several months and finally all treatment ceases unless there is a recurrence.

*Reaction.*—At the site of injection there is tenderness or pain upon slight pressure or upon movement of body. The area is slightly reddened and infiltrated. These symptoms may not appear until after the third injection. In the nose there are present symptoms of an acute rhinitis with marked pulsation, epistaxis, reddening of the skin about the anterior nares, loosening-up sensation, and increase of fetor in some cases. None of these reaction-symptoms appears in a normal nose after the injection of the vaccine. The nasal symptoms may appear after the first or after later injections. The regional reaction consists of flushing of the face and sensations of heat throughout the head, headache, and occasionally toothache. The general reaction consists of fever, and in a few cases nausea and vomiting. It must be said that although the above reactions are observed in a certain number of cases, the majority of patients suffer but little inconvenience from the injection of the vaccine.

*The Vaccine.*—The vaccine used in the treatment of ozena consists of a suspension of coccobacilli Perez in a normal salt solution. The bacteria used by Hofer and Kofler were taken from seven different strains. The methods used by Hofer in determining the number of bacteria in suspension are the same as those generally used in preparing vaccines.

*Results of the Hofer-Kofler Tests.*—There occurs in nearly all cases a decided decrease or a complete disappearance of the fetor. This conclusion is reached in the following manner: (1) Examination of patient; (2) examination of crusts after removal; (3) statements of members of patient's family.

This change in the degree of fetor takes place before a change in the crust formation is noticed; therefore it must be a result of a



specific action of the vaccine upon the fetor producer—namely, upon the *coccobacillus* Perez itself.

There next occurs a decrease in the crust formation. Sometimes the crusts assume a bright transparent green color following the vaccine injection. The pharyngitis sicca shows a marked improvement at an early stage of treatment. In cases complicated by laryngitis sicca, the same improvement is noted in the latter condition. In addition to these changes the patient's general condition improves.

Hofer and Kofler report 10 cases of ozena after eight weeks of vaccine treatment. The results were as follow:—

(1) Increased fluidity of nasal and pharyngeal secretion, usually beginning after the first injection (Cases X, IX, VIII, VII, VI, V, III, II).

(2) Decrease in amount of secretion and crust formation (Cases X, IX, VII, V, IV, III, II, I). Almost complete disappearance of crusts (Case VI).

(3) Decrease in fetor (Cases X, IV, III, II, I). Complete disappearance of fetor (Cases IX, VII, VI, V).

(4) Healing of chronic eczema about anterior nares (Case IX).

(5) Return to normal size of a previously constantly swollen nose (Case V).

(6) Improvement in Cases V and II, and recovery in Cases IX, VI, IV, I, from a condition present in every case—namely, pharyngitis sicca. Improvement in voice resulting from an improvement in a laryngitis sicca in Case V.

After eight weeks of treatment, agglutination tests upon the *coccobacillus* Perez were made with the patients' sera without getting a noteworthy agglutination titre. In the case of rabbits a high agglutination titre is observed after injection of the vaccine. This seems to indicate further treatment until the patient's serum reaches an equal power of agglutination.

Twenty-five cases of ozena which had been under vaccine treatment from several weeks to several months were observed by the writer at the Chiari clinic in Vienna:—

(1) Of these cases, I, II, VI, XIII, XX, XXI, XXII, XXIV were women; VII, VIII, IX, X, XII, XV, XVII, XXV were men; IV, V, XIV, XVIII, XIX, XXIII were girls; III, XI, XVI were boys.

(2) There was a marked decrease in crust formation in Cases I, II, IV, V, IX, X, XIII, XIV, XXII, XXIV; slight decrease in crust formation in Cases XII, XV, XVII; no change in crust formation in Cases VII, VIII, XI, XVI, XVIII, XIX, XX, XXI, XXIII, XXV.

(3) There was complete disappearance of fetor in cases I, II, III, V, IX, X, XIX, XXII, XXIV, XXV; marked improvement as to fetor in cases IV, XX, XXIII; no change in the degree of fetor in cases VII, VIII, XI, XII, XIII, XIV.

(4) There was a complete disappearance of the pharyngitis sicca in cases II, III, V, IX, X, XXIV, XXV; marked improvement in cases I, IV, VIII, XI, XIII, XIV, XV, XXI, XXII; no improvement in cases VII, XII, XVII, XVIII, XIX, XX.

#### CONCLUSIONS.

Concerning the fetor, Hofer reports a decided decrease or complete disappearance in nearly all cases. The effect of the vaccine upon this symptom is decidedly the most important of all, as the fetor is produced by the Perez organism alone, whereas the crust formation and the pharyngitis sicca are due in part to the abnormally large nasal cavities. Concerning the atrophy, the writer believes that no return to normal conditions will ever be made possible by the vaccine.

Among the 25 cases observed by the writer, there was a complete disappearance of fetor in 10 cases and a marked decrease in 3 cases. In 6 cases there was no change in the fetor. Supposing that the 6 cases not noted as to change in fetor did show some improvement, there still remains a rather large percentage of cases which showed no improvement. Although this does not coincide with the early reports of Hofer, in which was stated that in nearly all cases there was either a disappearance or marked improvement in the fetor, there is a sufficient number of improved cases to prove beyond all doubt the specific action of the vaccine upon ozena.

Among the cases observed by the writer there was a marked decrease in the crust formation in 10 cases, a slight decrease in 3 cases, and no change in crust formation in 10 cases. In the cases reported by Hofer there was either an improvement or almost complete disappearance of crusts in 90 per cent. of the cases. Although there was a change for the better in only about half of the cases observed by the writer, and no case of complete disappearance of crusts, the improvement noted is sufficient to show that there is a definite influence exerted by the vaccine upon the crust formation; in addition it must be remembered that the crust formation is not due to the action of the coccobacillus Perez alone, but is also the result of the enlarged nasal cavities, a condition which has not been altered by the vaccine treatment.

Concerning the pharyngitis sicca, Hofer's reports show either a disappearance of the condition or marked improvement in 60 per cent. of the cases. There was either complete disappearance of the pharyngitis sicca or marked improvement in 16 of the cases observed by the writer. This is about the same result as that reported by Hofer. Although pharyngitis sicca is commonly present in conditions in which there exists enlarged nasal cavities not due to ozena, the decided improvement following vaccine treatment seems to indicate that in these cases it is due at least in part to the specific action of the Perez organism.

(1) The writer is convinced that the *coccobacillus foetidus ozænæ* Perez is the true cause of ozena, by the results of Hofer's animal experimentation.

(2) The vaccine made with the Perez organism exerts a beneficial effect in the majority of ozena cases.

(3) The Hofer method of treatment is in its infancy, so we may expect far better results as our technique in the preparation of the vaccine and in its administration improves.

(4) Because of the soluble toxin produced by the Perez organism, we have every reason to believe that in time a successful antitoxin will be produced which will, of course, be preferable to the vaccine now used.

In closing, the writer wishes to express his thanks to Dr. Hofer for the pure cultures of the *coccobacillus* Perez and to thank Dr. Hofer and Dr. Kofler for their kindness in granting him the freedom of their clinic and laboratory.

#### PRELIMINARY LABORATORY REPORT.

By CHARLES L. KLENK, M. D., of St. Louis.

Through the efforts of Dr. Guggenheim, two cultures of the *coccobacillus foetidus ozænæ* Perez were obtained from Dr. Hofer of Vienna.

These cultures represent two distinct strains.

Our first experiments with the *coccobacillus* were made with these cultures. Unfortunately the odor which is so characteristic of ozena was not noticeable in these cultures. Subcultures were made and the odor partially restored. Cultures on albumin agar restored the odor completely. Injection into the peripheral vein of the ear of a rabbit with a culture grown on plain agar did not give satisfactory results.

50,000 and 500,000 gave negative results. 1,000,000 produced a hemorrhagic condition of the nasal mucosa, but no bacteria were found.

Injection of 100,000,000 bacteria grown on albumin agar killed rabbit No. 4 in forty-eight hours. Pure cultures from the nose were obtained twenty-four hours after injection.

Albuminized agar, made by allowing a film of egg albumin to flow over the surface of the agar slant, seems to restore the odor completely and also tends to produce a more virulent organism.

In every instance by injecting the *coccobacillus* itself in sufficient numbers or in combination with other bacteria we obtained pure cultures of the *coccobacillus* from the nose.

Injections of a suspension of the typhoid bacillus, staphylococcus, colon bacillus, and the *coccobacillus* (100,000,000) gave a pure culture of the *coccobacillus* from the nose within eighteen hours after injection.



Dr. H. E. Miller kindly sent one of his patients from the Washington University Nose and Throat Clinic (Case I) presenting a typical ozena with the characteristic odor very marked. Cultures from the crusts of this case (1) on albumin agar plates gave us a mixed growth with distinct colonies of the coccobacillus with the odor of true ozena. We also obtained from these plates the pneumococcus, the staphylococcus (*aureus*, *albus*, and *citreus*), the streptococcus, and the bacillus mucosus (the Abel-Læwenberg bacillus).

The colonies were very easily separated and pure cultures with the characteristic odor were obtained.

Injections into rabbits of a suspension of the mixed cultures produced a hemorrhagic inflammation in twenty-four hours and pure cultures of the coccobacillus were obtained from the nose.

Injection into rabbit No. 5 of 500,000,000 bacteria of the pure culture of the coccobacillus killed this rabbit in forty-eight hours, and the coccobacillus was again obtained in pure culture from the nose of this rabbit.

100,000,000 bacteria injected into rabbit No. 6 produced a hemorrhagic condition in twenty-four hours, and a pure culture of the coccobacillus; in forty-eight hours a slight mucopurulent discharge was noticed; in sixty hours a distinct greenish purulent discharge was present. Our cultures from the nose gave the coccobacillus, the bacillus mucosus and a few other bacteria.

We have not as yet completed our experiments, having had time only for the earlier manifestations, but in the course of time we intend to present a more complete report.

Nevertheless our results thus far have convinced us that we know the true cause of ozena, have obtained the organism in pure culture and that the coccobacillus has a selective action upon the nasal mucosa.

We have also proved to our own satisfaction that the coccobacillus produces an extra cellular or soluble toxin which seems to have an effect upon the nose similar to the effect of the organism itself. An albuminized bouillon culture of the coccobacillus was filtered through a Berkefeld filter, and injections of the filtrate into the peripheral vein of the ear of a rabbit produced a typical hemorrhagic inflammation of the nasal mucosa in eighteen hours and a serous discharge in twenty-four hours. This condition became less severe in forty-eight hours, and completely disappeared in seventy-two hours. This recovery was expected as no bacteria were injected.

The treatment of ozena by the use of a vaccine made from the coccobacillus is now to be considered. Hofer, of Vienna, claims good results, but we are unable to report any results as we are just beginning our experiments along this line.

A pure culture of the coccobacillus is obtained. With sterile salt solution the organism is washed off the surface of the medium into a sterile bottle, and after thoroughly shaking to produce an even suspension, the vaccine is standardized and heated to 65 or 70° C. for one hour.

As an initial dose 50 to 100,000,000 bacteria are injected. In three to five days, if no reaction occurs, a second dose, somewhat larger than the first, is given. If there occurs a reaction after an injection, a second dose the size of the previous one is given in seven or eight days. This dose is used until no reaction occurs, then the dose is again increased, etc.

We shall, from time to time, present our results obtained from the treatment of ozena with vaccines.

Some of our vaccines have been prepared from the original cultures obtained from Vienna. We do not expect any special results from these, as only two strains were used. Hofer has so far isolated seven distinct strains of the coccobacillus and uses them all in his vaccine. It is from the autogenous vaccines that we expect the best results.

The fact that the coccobacillus produces a soluble toxin has led us to believe that the use of an antitoxin in place of the vaccine is worthy of consideration, and it is this form of treatment which we intend to try, and so prove or disprove its value.

It is very unfortunate that the European War has interfered with the splendid work done by Hofer and Kofler. This may result, however, in our proving the value of the antitoxin treatment before same is proved in Vienna.

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Metropolitan Building.

# A STUDY OF THE CHOLESTEROL METABOLISM IN A CASE OF CONGENITAL HEMOLYTIC JAUNDICE WITH SPLENOMEGALY.\*

By JACOB ROSENBLOOM, M. D., Ph. D., of Pittsburgh,

AND

JAMES P. MCKELVY, M. D., of Pittsburgh.

One of the most characteristic findings in cases of congenital hemolytic jaundice with splenomegaly is the lessened resistance of the red cells to hypotonic sodium chloride solutions. This was first noted by Chauffard<sup>1</sup> and has been confirmed by many other workers.<sup>2</sup> Chauffard found that in normal individuals hemolysis started on addition of 0.44 per cent. sodium chloride solution and was complete at 0.36 per cent. The reason for this lessened resistance of the red cells has never been explained. We present in this paper a study of the cholesterol metabolism in a patient with congenital hemolytic jaundice and splenomegaly, and also attempt to develop a hypothesis regarding the mechanism of this lessened resistance of the red cells.

In testing the osmotic resistance of the red cells of this patient, the same technique was used as that described by Richards and Johnson. The following table contains the results, showing that the red cells of this patient had a lessened resistance towards sodium chloride solutions.\*\*

TABLE I.  
HEMOLYSIS TESTS OF PATIENT'S BLOOD.

	Strength of sodium chloride solution in per cent.											
	0.375	0.40	0.425	0.45	0.50	0.525	0.55	0.575	0.60	0.625	0.65	0.90
Patient's washed red cells	++++ ++	++++ ++	++++ ++	++ ++	++ ++	++ ++	+++	+++	+++	++	+	0
Control normal	+	++	0	0	0	0	0	0	0	0	0	0

In this table +++++=complete hemolysis.

++++=moderate hemolysis.

+++ =slight hemolysis.

++=very slight hemolysis.

+ =trace of hemolysis.

0=no trace of hemolysis.

\*From the Allegheny General Hospital and the Laboratory of Dr. James P. McKelvy, Pittsburgh, Pa.

\*\*The work of Vaquez and Ribierre (*Compt. rend. Soc. de biol.*, Vol. LXI, p. 1586, 1913) has demonstrated that in conditions of obstructive jaundice, the erythrocytes have an increased resistance to hemolysis by hypotonic salt solution. Chauffard, in contrast to these results, found that the corpuscles in 3 cases of chronic acholuric icterus presented a greatly diminished resistance.



For the metabolism study the patient was put on the following diet:—

Whole milk.....	300 c.cm.
Cream. . . . .	150 c.cm.
Horlick's malted milk.....	100 grm.
Sugar. . . . .	10 grm.
Salt. . . . .	4 grm.
Butter. . . . .	5 grm.
Eggs (minus shell).....	240 grm.
Water. . . . .	1000 c.cm.

This diet contains approximately 60 grm. protein, 75 grm. fat and 112 grm. carbohydrate, yielding 1,395 calories or about 50 calories per kilogram body weight of the patient. The milk, cream, malted milk, sugar and salt were mixed daily, and 1 oz. was taken out daily for cholesterol estimation, which was made on an aliquot portion of this daily mixture. The cholesterol content of the butter and eggs was also estimated. Cholesterol was estimated by the method of Windaus.<sup>3</sup> The feces were demarcated by means of carmine, into a period of five days.

TABLE II.  
THE CHOLESTEROL METABOLISM.

<i>Date</i>	<i>Cholesterol intake grm.</i>	<i>Cholesterol in feces* grm.</i>	<i>Balance grm.</i>
12/10-12/14	5.22	12.27	7.05

\*The large amount of cholesterol in the feces fat could be noted macroscopically.

It may be seen from the above table that there is present in this patient some interference with the cholesterol metabolism, as shown by the large loss of cholesterol from the body, 7.05 grm. in five days. May this not play a part in the pathogenesis of this condition?

As the lessened resistance of the erythrocytes to hemolysis is a marked feature of this condition, and as we have found a disturbance in the cholesterol metabolism of the case studied by us, it will be of value for us to consider certain phases of hemolysis. It will be recalled that if every trace of serum is removed from erythrocytes, the corpuscles will not be dissolved by cobra venom, tetanus toxin, solanin, saponin, etc. If, however, the serum is not removed from the corpuscles, they are immediately dissolved on adding the hemolytic agent.<sup>4</sup> The mechanism involved is that there is some substance present in the blood serum allowing the hemolytic agent to act. It was then found that ordinary lecithin could be

substituted for the blood serum. Just as lecithin accelerates the activity of certain hemolytic agents, cholesterol inhibits it; that is, if cholesterol is added to a suspension of red cells, lecithin added, and certain hemolytic agents, it will be found that hemolysis does not take place. It may well be that the hemolytic jaundice in these cases is due to the fact that, owing to some perversion of metabolism, there are a lessened cholesterol content of the blood serum and not enough cholesterol present to exert its antagonistic action to prevent hemolysis which might occur due to absorption of various substances from the intestines and other organs. The results of Anichkov<sup>5</sup> are also of interest in this connection. He fed rabbits for long periods with cholesterol, dissolved in sun flower oil, and also with egg yolk. The spleen and bone-marrow were studied macroscopically and microscopically and by polarized light. He found the spleen hyperplastic and filled with fat droplets, having the characteristics of cholesterol compounds. Isotropic neutral fats were also present in large cells of the spleen pulp. He concludes that this experimental cholesterol steatosis or large celled splenomegaly has many characteristics in common with the so-called splenomegaly of the Gaucher type. The changes in the bone-marrow correspond in most particulars with those in the spleen. As the red cells contain a considerable amount of cholesterol, may it not be possible that perhaps the spleen is the organ in which the red cells are destroyed in great numbers, and owing to this the splenomegaly results, as in the experiments of Anichkov?

Fraser and Gardner<sup>6</sup> have found that the sera of rabbits fed on cholesterol exerted an inhibitory action on the hemolysis of blood by saponin. It might be that the lack of ability of this patient to metabolize cholesterol normally produces a vicious circle, as owing to the lack of cholesterol in the blood, hemolysis takes place, leading to an increased amount of cholesterol free in the organism, but not retained in the serum.\*

The fact that Widai and Philibert were unable to demonstrate the presence of hemolytic properties in the serum of their own patients, either in regard to their own corpuscles or those of other persons, and that they also found that the fragility of the red cells, so marked towards hypotonic salt solutions was also evident in respect to various other hemolytic agents, add weight to the theory advanced in regard to the assumed function of the cholesterol of the blood.

In this connection it must also be recalled that the experiments of Hausmann and of Abderhalden and Le Count have proved that

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\*See Pribram, *Biochem. Zeitschr.*, Vol. I, p. 413, 1906; *Therapeut. Monats-schr.*, p. 590, 1908 (discussion of rôle of cholesterol as an antagonist to hemolytic substances). Kusumoto (*Biochem. Zeitschr.*, Vol. XIV, 5, 1908) found an increased secretion of cholesterol in the bile after the administration of poisons which caused an increased destruction of red cells.

while cholesterol inhibits the hemolytic action of saponin, the esters of cholesterol do not.

It has also been found by Chauffard, Laroche, and Grigaut,<sup>7</sup> and by Obakevitch,<sup>8</sup> that the blood serum in congenital hemolytic jaundice contains a lessened amount of cholesterol. These findings also bear out our hypothesis regarding this condition.\* Many observers<sup>9</sup> have been able to increase the cholesterol content of the blood by feeding cholesterol or by giving a diet rich in this substance. Indeed, lately Lindborn<sup>10</sup> has given cholesterol to a patient suffering from hemolytic jaundice.

The increased excretion of cholesterol may also account for the attacks of abdominal pain suggestive of biliary colic that is present in the disease. These attacks may be due to the presence of gall-stones formed from the abnormal cholesterol metabolism. Gall-stones have been found in 5 of the 6 cases of congenital hemolytic jaundice that have come to autopsy, in every instance in which the gall-bladder was examined.

After the completion of this work the communications of Medak<sup>11</sup> and King<sup>12</sup> appeared. Medak's paper contains estimations of the cholesterol and cholesterol esters of the blood in various diseases which interest us in this connection. The following data are taken from his paper:—

<i>Disease</i>	<i>Free cholesterol in 1,000 c.cm. blood grm.</i>	<i>Combined cholesterol in 1,000 c.cm. blood grm.</i>	<i>Total cholesterol in 1,000 c.cm. blood grm.</i>
Catarrhal jaundice.....	0.8377	0.4150	1.2527
Icterus gravis (mechanical).....	1.3900	0.4917	1.8817
Jaundice (on admission).....	1.8200	0.8856	2.7056
Jaundice (after disappearance of jaundice).....	1.2600	0.7190	1.9790
Pernicious anemia.....	0.7537	0.6560	1.4097
Anemia (tuberculosis).....	0.6887	0.3234	1.0121
Polycythemia (cardiac).....	1.0065	0.3310	1.3375
Polycythemia.....	1.0960	0.4640	1.5600
Hypertrophic cirrhosis.....	0.4855	0.6360	1.1215
Hypertrophic cirrhosis.....	2.6040	1.0850	3.6890
Banti's disease before splenectomy....	0.9736	0.3480	1.3216
Banti's disease after splenectomy....	1.3980	0.7356	2.1336
Banti's disease before splenectomy....	0.9510	0.5470	1.4980
Banti's disease after splenectomy....	1.0720	0.7140	1.7860
Hemolytic icterus (before splenectomy)	0.4910	0.6330	1.1240
Hemolytic icterus (after splenectomy)	0.9560	0.3460	1.3020

The results given in this table showing a larger increase in the amount of free cholesterol in the blood following splenectomy in the case of hemolytic jaundice, and the fact that the amount of free

\*The cholesterol content of the blood serum in various diseases is well discussed in the following references: McNee, *Quart. Journ. Med.*, Vol. VII, p. 221, 1914; Grigaut: "Le Cycle de la Cholesterinémie." Paris. 1913.



cholesterol in the blood of this case before operation is much less than in any of the other diseases, speaks in favor of our idea that there is some relation between the increased fragility of the red cells as observed in hemolytic jaundice and the cholesterol content of the blood and also the splenomegaly.

King's results also tend to confirm our hypothesis. He found that following splenectomy there occurred an increase in the total fats and cholesterol in the blood.

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TICS.

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(CONCLUSION.)

Dr. L. Pierce Clark, of New York City, has recently made some intensive studies on tics and ticquers. He has concerned himself with the personality studies of the ticquer, and has attempted to unravel the genesis and evolution and the significance of tics, carrying on his observation and speculative study from the Freudian standpoint, so that as a consequence we find him trying to give a definite psychological and sexual significance to the tics. Clark has published a series of three papers which deal with this subject.\* In his last (third) paper he has developed his theory to quite a mature degree.

The writer feels that in view of the widespread movement toward Freudian psychanalysis, and in view of the far-reaching significance of the conclusions arrived at by Clark, who, as stated above, has here followed up the Freudian trail and assumed the Freudian attitude, it is advisable to give a summary of the conclusions reached by an application of Freudian principles to the problem of the elucidation of the meaning of tics. In his studies upon mental torticollis as a form of psychoneurosis of the obsessive type, Clark attempts to demonstrate that certain types of tic, such as mental torticollis, are but continuations of habit movements. The tics, he believes, remain as fragments of the complete habit, and persist as crude symbols which serve as a most intimate and deep need of the abnormal personality of the individual. Instead of, as was the custom formerly, looking upon tics as defenses against unpleasant situations in life, he now believes that they are really pleasurable gratifications to the psyche, and this pleasurable feeling is considered to be of a sexual nature. In his first paper Clark presents a case of chronic mental torticollis, while in his second paper he analyzes a case of acute mental torticollis, both being presented with full life histories and personality studies; and Clark believes that he is justified in tracing the genesis and evolution of the tics

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\*First paper: Some Observations Upon the Etiology of Mental Torticollis. (*Med. Record*, February 7th, 1914.)

Second paper: A Further Study Upon Mental Torticollis as a Psychoneurosis. (*Med. Record*, February 28th, 1914.)

Third paper: Remarks Upon Mental Infantilism in the Tic Neurosis. (*Med. Record*, March 28th, 1914.)

and of the accompanying mental state, with its varied psychasthenic features, on Freudian lines. It is, however, not until we come to his third paper on this very interesting and fascinating subject that we find Clark developing and offering a rounded-out theory for the genesis and evolution of the psychic and physical aspects of tics. And it may be said that this third case is one of multiple tics complicated by psychasthenic features. Clark is to be highly praised for his conscientious and very intensive and earnest efforts to explain tics and ticquers from a genetic standpoint, and particularly because of the consideration of the real motives of the tic disorder or rather of the ticquer. He remarks upon the mental infantilism shown both in adolescence and in later life in the 2 cases reported in his first two papers, this mental infantilism having been shown in their never having established really friendly relations with a large group of other children; their not having been able to get *en rapport* with their social environment; their having had inconclusive love affairs; their having been unmarried, having presented inadequacy of feeling and will, and having lived in a vague world of doubt, indecision and vacillation. (Without discussing this portion of the paper, the writer may mention the fact that all these symptoms or tendencies occur in other individuals who do not present tics; and, furthermore, that all normal individuals possess these qualities or tendencies in varying degrees of intensity and in varying combinations, and that this applies to adults as well as to children, although, of course, they are seen most characteristically in children. He may further add that the difference between the mental infantilism which we find present in the tic neurosis and that which we observe in other (normal or abnormal) conditions is one of degree rather than of kind. Therefore, the most we can say of the mental condition in ticquers is that there is an exaggeration of this mental infantilism or a fixation or tendency toward regression to this type of thinking or of reaction. And this leads us to the further conclusion—and it is this point which the writer desires to bring out in this connection—namely, that since the difference between the mental infantilism in all these conditions is relative, being one of degree rather than of kind, it naturally follows that what shall hereafter, in the conclusions of Clark as mentioned below, be asserted to be an absolute and basic principle or truth applicable to the tics will consequently be true, but in less degree, of all the other conditions of a similar or allied nature.)

Let us now proceed with a review of the findings of Clark. He tells us that the mental nature and origin of tics, as first laid down by Charcot and further developed by the French school headed by Brissaud, has come to be more and more strongly emphasized, and reminds us that in tics the original voluntary and rational acts later become involuntary and irrational. He asserts that mental infan-



tilism is a polymorphous defect of the psyche, with which, of course, all will agree, and that this is seen most pronouncedly in the presence of a uniformly weakened will. The ticquer's mental defect is not so much evidenced in mental insufficiency as in an inequality of mental development. There is found an embryonic condition of one or the other of the mental faculties. Most imperfections of mental balance are normal in the child, but are generally overcome in great measure in adolescence. The ticquer's childhood development is relatively vacillating and volatile, this disharmony and ambivalence (better called ambitendency) being seen more particularly in the emotional sphere, example and heredity doing their share.

In remarks upon the genesis of the insufficiency of will, and the irresolutions of the ticquers, Clark mentions that they may have inability to concentrate the attention to read, that they may present signs of incomplete sublimation of the hate instinct with resulting illusory ideas of sadistic satisfaction, that as ticquers think so they tic, and that in most cases the pent-up, unsatisfied libido overflows in a whole series of habit movements. The same or different cases may show varying degrees of severity and combination of general, physical and mental restlessness, habit movements, tics, obsessions (fixed ideas, phobias and various types of obsessive thinking). Frequently the obsessive mental state is the foundation upon which the tic is built.

Although no direct connection between obsessions and tics may be shown, yet if the motor symptoms and the psychic state are traced to their genetic origin, there is, as Clark puts it, an intimate and common stock fund of energy from which they both proceed. He endeavors to show that tics are due to the primary warring instincts of love and hate—which is the starting point of so many of the psychopathic illnesses, according to the theory of the Freudian school.

In a footnote, after explaining the Freudian theory of the genesis and significance of obsessive acts and thinking, the above-mentioned author gives us the following as a tentative hypothesis: In ticquers there is a certain type of nervous (organic and structural) make-up which is inherited, thus explaining why other individuals with the same struggles and conflicts as ticquers do not develop tics. "In such (individuals) the emotional life is precocious much beyond the intellectual faculties. The ticquer in infancy has the emotional feelings of love and hate of an adult. Their (the ticquers') very precociousness aids the parental fixation and adhesion, and makes it the more difficult for the libido to detach itself at the proper age. One should bear in mind that the parental fixation in itself does not directly produce the mishaps of later life, but this small fault in infancy generates wider and wider maladaptations as development progresses. It is these latter glaring faults and trends that make

for the character defects, and these really break down the final effort at adaptations and adjustments producing the tic or obsessive disorder. But the essential nucleus of the defect is the lack of balance, precocious parental fixation, and continued attachment to the parent stem that makes the adult defect possible. The very infantile precociousness of the emotions argues for the hereditary transmission of the destructive temperamental qualities. Here, as elsewhere in tracing hereditariness in the so-called functional nervousities, one should take as the unit character for study the *mental traits* or *trends* and exclude definite disease entities applied to ancestral disorders. I believe it is not too supposititious to think that many of these variant types of obsessive individuals are really atavistic in make-up and have continued on from one generation to another special defective traits of emotional make-up which are fortunately denied the average individual."

From this review it is seen that he believes that the general tendency toward tic and obsession formation—not, of course, any special tics or obsessions—is dependent upon a certain emotional precocity which in turn is conditioned by an organic, nervous defective make-up. But what is said about the infantile and childhood life histories with parental example and parental attachment and fixation would all be very well in its way were it not for the simple but most important fact that the Freudian school, including Clark, have here given a purely psychological and sexual interpretation to all their findings and speculations, whereas, if we would be unbiased, impartial and in search of the real, untarnished truth, we should approach the subject from a biological or at least a psychobiological standpoint, with due consideration for the entire evolutionary and developmental life-history, including all possible experiences, centered about all of man's instincts. The writer calls particular attention to Clark's statement that in those who are afflicted with obsessions or tics the sexual attachments to the parents are necessarily most infantile, and that the maximum faults concern the emotional sphere of the mind, and that, too, concerned or flowing out of the sexual instincts. At another point Clark tells us that in ticquers the personality defect is based upon the most primitive infantile sexual life and instincts, and it is in this way that arise the difficulties in alteration of the personality defect and in the elimination of the tic.

As a final summary of his theory for mental infantilism and its particular tic disorder, Clark offers the following statement which the writer will here quote in full: "The ticquer has a strong sexual parental attachment; this is so strong that the love instinct ineffectually sublimates the hate instinct and in the warring conflict doubt and physical and psychical inadequacy arise. This situation continues and generates mental and physical infantilism, which in

turn make for increased feelings of tension. Motor and psychic restlessness succeed. The motor expression manifests itself most often in habit movements of disguised sexual significance (auto-erogenous pleasures), a form of physical stereotypy, in its broadest psychophysical meaning. The mental state often *pari passu* takes up obsessive thinking, and various physical acts and thoughts are formed as defense mechanisms, born of conscious guilt. The motor habits are usually inhibited or displaced in part, and the tic remains as a motor symbol, usually in itself nonsexual, as a fragment of the former complete habit movement. The mechanism of the completely evolved tic is either a *conversion* (hysteric) or *substitution* (obsessive) mechanism or both."

The writer will not attempt to enter into a criticism of the theory which he has taken the trouble to present so fully. An extended criticism of this theory would lead us into numerous, lengthy and tiresome discussions and would carry us too far afield.

In contrast to the above theory the writer will present rather briefly a theory of his own which is based on a biological and evolutionary standpoint, and which adheres to the theory of the physiological and biological defense method of formation of tics. No effort has been made by the writer to unravel the mental picture on these same grounds.

It seems to him that the pathogenesis of tics and allied conditions can best be appreciated by viewing the subject from an evolutionary standpoint. In our reactions and adaptations to the varying experiences with which we meet, we respond by one or more of several methods of reaction. These are of increasing complexity as we ascend the scale of evolution and development. The simplest manner of adaptation is by simple, reflex muscular action, the response being anatomical and not physiological in its extent. A more complex reaction is by physiologically coordinated motor reactions or movements, which go to comprise our expressions or pantomimic movements. This is seen most characteristically in our facial expressions, gestures, mimicry and dancing. Still higher up in the scale we find our conduct as shown in written and printed language. And finally, highest of all, we must place our conduct and feelings as exemplified in our speech. This is a brief outline of our evolutionary ascent and of the increasing complexity and refinement of our social conduct. In our adaptations we respond in one or more of these ways. When for some reason or another one outlet is denied us, we find avenues of expression through one or more of the other paths. Dependent on our stage in evolution and development, on the development of our senses, on our instincts, on our feelings and emotions, on our intellect and experiences, we find the manner and degree of our response. Unable to find expression by means of speech, we instinctively fall back upon and seek expression



by a less refined method, one earlier acquired and thus lower in the scale of evolution. This has a more or less general application throughout the scale of human, individual and social conduct. It is an application of the universal law of adaptation to existing conditions under the best manner possible under the circumstances. We may thus lay down the general law of psychophysical progression, fixation and regression along marked out, evolutionary and developmental lines. We may react mainly physically, or mainly psychically. But as a rule we react by both physical and psychic means, the manner and degree of our conduct being determined, as above mentioned, by our stage in evolution and development.

How does this apply to the problem of the tics? The relation seems to the writer to be most intimate and most important. The tics are methods of response or reactions to certain external irritations or ideas, this response being the manner of adaptation. The response may be mainly motor or mainly psychic—most frequently psychomotor. When the source of irritation and the cause for action is known, our conduct is more specific and is apt to be less diffuse, less inadequate, less indefinite. In our reactive adaptations, which, as explained above, are greatly dependent upon our psychophysical make-up or constitution, we protect ourselves consciously, or more or less unconsciously, against disagreeable, inimicable, unpleasant or irritating environmental factors, physical or psychical, by bringing into activity certain psychical or physical or psychophysical reactions or processes. The special defense reactions brought into the foreground are those which follow the line of least resistance, due to hereditary or environmental construction, or are those which were most intensely stimulated or irritated, and the biologically most useful and adaptive at the particular moment or under the special circumstances. The young child's reactions are preponderately motor, or at any rate psychomotor and not purely psychic. When there are sources of irritation or bodily or mental discomfort, there is a more or less general bodily reaction, psychophysical in nature. When the irritation is definite and clearly recognized by the child, the local motor response is also apt to be definite. When, on the other hand, the irritation is but vaguely perceived and not clearly appreciated or localized, we find that the child may show a general diffuse reaction, or even, in some cases, a reaction limited to certain regions as determined by the reaction taking place along the line of least resistance. This is plainly seen in the conduct of the physically sick child. Every pediatrician will find ample proof in support of this statement in his observations of the defensive reactions of the ill child.

When this irritation is oft repeated or quite constant, we have a consequent repetition of the defensive reaction, whatever it may be. This performance may be so frequently repeated that the idea of

irritation or conflict, or the anticipation or the expectation of a repetition of same, may be quite sufficient in itself to arouse this reaction. It may become so habitual that, even though no such idea be in the mind, there may be a repetition of the movement whenever the individual is nervously excited or upset, whenever there is any mental stress, strain or discomfort. And we may go even further and say that as a result of some unusual mental struggle, some excessive mental strain, defense or adaptation is brought about by regression or resort to a tic, this being conditioned by the fact that for the particular individual under discussion this is the easiest, most convenient or most immediate form of reactive response. The discharge is, as is seen, along the line of least resistance. This line of least resistance is determined by the organic nervous constitution or by certain life-experiences or habit-formation factors. In some cases the movement, once initiated, may be continued long after the disappearance or cessation of the external irritation, because of the sense of relief or satisfaction or pleasure which is obtained by the performance of the tic. In many instances the habit has become rather fixed, and, as a relief from the struggle to do or not to do the movement, and because of fatigue in the effort to inhibit or control the movement, the individual adopts the path of least resistance best for immediate relief from mental struggle; and as a psychobiological effort at self-preservation and self-gratification, as immediately as possible and at any cost to be paid in the future, he gives vent, as it were, to the movement.

The psychic symptoms may come on at a later date than the motor symptoms, or simultaneously, although, of course, the early life history, in childhood and puberty, for example, if we are dealing with an adult, will show, at least in the great proportion of cases, that the individual was of a psychopathic type, perhaps somewhat shut-in or asocial. If the appearance of the psychical symptoms be simultaneous with that of the physical symptoms, we can understand at once how, like the motor symptoms, they may be repeated time and again. In many instances, at least, the psychic symptoms arise later, being added to the motor symptoms. These later psychic symptoms may be a direct reaction to the source of irritation, or may be occasioned by the dissatisfaction at being unable to control the movement in question.

The degree of reaction, its duration and severity, depend upon the hereditary and developmental make-up of the individual and the severity, frequency and duration of the irritation, physical or psychical. The psychic element is particularly apt to vary. The more neuropathic and psychopathic the make-up the greater is the reaction.

Where mental enfeeblement or mental disorder exists, the severity and chronicity are apt to be still greater.

There is thus a fixation, or rather a regression or reversion, often repeated, to a type of reaction of a very infantile, primitive sort, far down in the scale of evolution and development.

This picture may be further complicated by neurasthenic, psychasthenic, hysterical or other reactions. Naturally one would expect to find these conditions, especially the more aggravated forms, in individuals of a neuropathic and psychopathic family strain, and who themselves are neuropathic or psychopathic, or both.

The author will not develop this idea of psychophysical progression, fixation and regression in this paper.\* But he believes that by an application of this theory we can give a fairly satisfactory explanation from the biological or psychobiological standpoint, for most or all the symptoms which occur in the tics and in neuropathic and psychopathic individuals—for the tic movements, the associated mental states, the suggestibility, the morbid ideas, the cries, the strange, impulsive expressions, the hysterical and psychasthenic symptoms, the conduct of the mentally defective and the so-called insane.

It may be mentioned here, as is clearly appreciated from what has been said before, that there is an interrelationship between the tics on the one hand and the symptoms which we discover in the psychoneuroses, psychoses and the mentally unstable on the other.

In all these conditions we find a cortical origin for the disturbance, there is lack of will-power, of inhibition and of control of the lower centres, there is a nervous and mental instability with a tendency toward regression or dissociation, and the assumption of more or less independent, almost automatic activity, this activity being characterized by its almost relatively infantile, primitive, archaic make-up.

Were the writer to take up anyone of the tics as an illustration, this general idea could be applied very nicely. But he will not present any illustrative cases in this paper. He will leave it to the reader's fancy, however, to explain the genesis and evolution of, for example, facial tics (which are so common) from this standpoint.

In passing, the writer may say that the tic movements may have a special, individual, psychological significance. But this is by no means necessarily so. Frequently, he is inclined to believe usually, these movements result merely because there has been effected a psychobiological reaction, following the law of psychophysical progression, fixation and regression, with involvement of the nervous paths most seriously affected or most easily disturbed.

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\*In a forthcoming paper on the genesis and meaning of tics, this theory will be more fully developed.



## TREATMENT.

The general impression and the confirmed attitude of many physicians is that the condition is quite incurable and that the affliction should be viewed in a most pessimistic frame of mind and through very dark blue glasses. This attitude is too extreme. Tics are by no means necessarily incurable. Cases which are put under proper treatment in an early stage, in individuals whose cooperation has been fully obtained and in whom a psychanalytic study of the tic and the personality defect is made, with efforts at reconstruction of the personality, may make rather rapid and remarkable recoveries. Up to the present time, however, the cases have not been as vigorously attacked as they should be. Another handicap has been that these cases have been allowed to pass through the early stages of this unfortunately deep-rooted condition without any treatment whatsoever or with treatment at incompetent hands. It must also be remembered that in these cases, in addition to the motor defect of the tic disorder, we have the psychic aspect of the case which is really the important element which must be attacked in the treatment, so that we find that we are face to face with the treatment of a general psychasthenic state, where, of course, the development of the increase of the will-power is a *sine qua non* in the treatment, if we expect to obtain worthwhile results. We must also remember that the tic condition is not a precursor of insanity, although, to be sure, both these conditions may develop on the same defective basis.

*Surgical Treatment.*—The surgical treatment is mentioned here to remind the reader that there is no surgical treatment for tic. A loud note of warning should be sounded against surgical treatment in this condition, particularly in the case of mental torticollis. Nothing can be expected from surgical treatment in a condition of this sort. On the other hand, we must not forget that paresis is the result in every case which is operated on, and with this paresis we have a resulting atrophy and permanent deformity and all without relief or cure of the condition. Moreover, it may be mentioned that the subsequent contraction of the scar will involve other muscles. In certain cases of true reflex spasm, cervical or facial, surgical treatment may be resorted to; but this does not apply to true tic, where it is positively contraindicated.

*Hygienic Treatment.*—General hygiene is of some value in this condition. A regular life, simple, methodical and systematic, is helpful. Short baths are tonic in their effect. Foods of a simple and non-irritating nature are advisable. There should be ample means both of physical and mental occupation. The patient should have plenty of sleep. And in all cases where the general hygiene of the patient is below par there must be a building up of the general bodily health.

*Drugs.*—It may be said that sedatives are of little if any value. Bromides may be used in certain cases for their sedative effect. Hoppe\* has found the regular administration of sedatives at bedtime to be valuable in diminishing the severity of the attacks. He recommends strontium bromide, according to age, generally in 30 gr. doses, at bedtime. Of course, any of the other sedatives may be employed. In severe cases, for temporary relief, one may resort to chloral, and even, in some instances, to chloroform by inhalation. Nerve tonics have no effect upon the condition. Arsenic is of no value. Serotherapy and organotherapy are entirely uncalled for in this disease. Hyoscine is of little or practically no value.

*Hydrotherapy*, in the form of wet (preferably hot) packs, are soothing.

Oppenheim reports one case of tic of the facial muscles in which there was a disappearance of the affection after the removal of the tonsils.

*Electricity* is valueless.

*Suggestion and hypnotism* are generally useless, except in cases with an hysterical coloring. On the other hand, it is known that ticquers are with difficulty susceptible to suggestion or hypnotism, and where the results are favorable they are generally only temporary.

Efforts at perfect muscular relaxation, at keeping the body quiet, particularly the special muscle groups involved, and attempts at automatic and emotional reflex defense movements, when systematically carried out, are very important aspects of the treatment of this rebellious condition. Various methods of re-education have thus been developed.

*Re-education.*—Mental control is the essence of the treatment. Training in certain exercises is the method employed in practically all systems of treatment. Oppenheim advocates inhibitory exercises, Brissaud, Meige and Feindel psychomotor re-education, and Pitres and Cruchet breathing exercises. Oppenheim's method is as follows. He finds gymnastic exercises very valuable, and so he first has the patient go through a number of gymnastic movements under supervision. This is then followed by inhibition exercises, which consist in keeping the body or special parts of the body perfectly still and in suppressing reflex movements, emotional movements and the like. These latter inhibitory exercises should be of short duration at first, being later gradually increased in duration. These inhibitory exercises should be immediately followed by free gymnastic exercises, on which point we find Meige and Feindel, Brissaud, and Oppenheim in perfect accord. Oppenheim further lays special stress on the practice of repression of reflex and defensive move-

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\*In his paper on Tics in White and Jelliffe's "Modern Treatment of Nervous Diseases," Vol. II.

ments and of the expressions of the emotion. For instance, have the patient suppress the lid reflex (that is, refrain from blinking) while you are slowly bringing a pointed instrument near to his cornea or while you make a dash with some sharp instrument at the patient's eyes; let him suppress the nasal reflex while the mucous membrane of the nose is being tickled; let him suppress the withdrawal of a limb which is being tickled or is subject to pain; he should refrain from laughing while he is being tickled; and other exercises of a similar nature. In this way the patient is being given training in the exertion of his will-power and in the inhibition and suppression of reflex, defensive movements. The practice of these so-called inhibition gymnastic exercises should be characterized by regularity, routine and persistence, and perseverance.

Meige and Feindel,\* who have extended the method of Brissaud, advocate the so-called psychomotor discipline and have their patients drill before the mirror. Their method consists in a combination of immobilization of movements and movements of immobilization. These exercises are of short duration in the beginning. The treatment is begun with movements of immobilization, in practising which the patient is required to remain motionless, in sitting position, as if posing for a photograph, first for a few seconds, then longer and longer up to one-half hour; first in the sitting position, then in the standing position, then while walking, or while performing certain movements; or general immobilization may be practised at first, this to be followed by immobilization in various positions and in various attitudes of the arms, legs, head, etc., especially with relation to the tic. It is absolutely necessary that the method and its object be fully explained to the patient, and his entire cooperation be obtained. In addition to the training of inhibition the patient must next practise exercises of immobilization of movement, with reference to particular movements, especially those concerned in the tic, systematically, slowly and accurately performed. These exercises are of short duration, never beyond a half-hour, three or four times a day. It is better to perform these before a mirror. They must be continued for a long period of time following the cessation of the tic, since relapse may occur. Opposed and antagonistic movements may at times be brought into play and may themselves in certain cases become tics.

In the case of children, stringency of the parents is always necessary. Persistency and regularity are essentials in all cases.

Each tic is an individual case.

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\*In their well-known book "Tics and Their Treatment," English translation by S. A. K. Wilson, 1907.



Pitres\* and Cruchet\*\* are advocates of breathing exercises. These consist of slow, deep inspiration, with raising of the arms, and expiration, with falling of the arms, performed three or four times a day, for ten minutes each time. These act by divergence of the attention from the tic and concentration of the attention on the exercise in question.

In the same way the practice of various orthostatic exercises, of postures and attitudes, so strongly advocated by Taylor,† of Philadelphia, may prove of great value here and contribute considerably toward the attainment of that mental and bodily repose and equipoise which is so important and essential in this condition.

Games and sports, and manual training should also prove of value in these cases, and may be very profitably employed.

It cannot be stated too often or too emphatically that in every case the patient must be made to understand the treatment thoroughly, to cooperate whole-heartedly, to believe in the treatment and in the usefulness of it. His enthusiasm must be aroused and his will-power must be stimulated. In fact, we find that the patient must be continually influenced, daily or weekly, for months or years.

Complete success may take place in some cases. Partial success is frequent. And failures will often result.

*Psychnalysis.*—In conclusion, a few words must be said about treatment by psychanalysis. Earlier in the paper this subject has been discussed at some length under the heading of pathogenesis. Psychanalysis permits us to gain an insight into the genesis and evolution of the tic, into the various character defects and their relationship to the tic movement. This personality study is most necessary for a true understanding of tics and ticquers, for, without this, truly scientific and intelligent treatment cannot be carried out. The analysis of the genesis and evolution of the tic and the analysis of the character defects of the patient must be followed by efforts at reconstruction of the personality with the elimination of the personality defects, in so far as this is possible of attainment. Clark reports rapid early improvement in the 3 cases which he has recently reported in the articles referred to earlier in this communication. But, of course, only continued observation of these cases for some time will tell how permanent the improvement has been.

The writer wishes to call attention to the fact that psychanalysis alone is not sufficient, but must be followed by efforts at training of the will-power to overcome the defects in the personality.

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\**Journ. de méd. de Bordeaux.* 1901.

\*\**Thèse de Bordeaux*, 1902, and *Traité des Torticol. Spasmod.*, Paris, 1907.

†See the various numbers of the *Monthly Cyclopedia of Medicine* for the past two years.

He would also remind the reader that when he refers to psychanalysis he does not refer specifically to psychanalysis based on the Freudian theories, as detailed under pathogenesis above, but he means psychanalysis in a broad, impartial, unbiased way, where full credit is given to all our instincts and where we are not binding ourselves down to any particular school of psychanalysis.\*

It is obvious that psychanalysis may well be combined with the training exercises described heretofore.

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\*See the writer's paper entitled "A Plea for a Broader Standpoint in Psychanalysis," *The Psychoanalytic Review*, Vol. II, No. 1, pp. 52-72, January, 1915.

## STUMP TREATMENT IN APPENDECTOMY.

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By CHARLES H. PARKES, M. D., of Chicago.

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Much discussion has been indulged in upon the subject with which this paper deals. It is, after all, one in which the adoption of a uniform plan seems to be about as possible as the adherence to the use of catgut in the abdomen to the exclusion of silk, or vice versa.

It is an interesting study to observe the different schemes adhered to, in the work of different men, in the technique of this manoeuvre. In this regard one is led to wonder what post-operative records show regarding pain, fistulæ, infection of the wall of the cecum, and obstruction due to adhesions. It would be exceedingly interesting to compile statistics on this question, based upon the many subsequent operations performed for the relief, not of a pathological appendix, but for pathology due to a previous appendectomy. Naturally, this subject alludes only to those operations performed during quiescence, with no active inflammatory process existing. In cases where there is an active inflammatory process, even though slight, subsequent adhesions and other untoward results are not surprising. In interim cases without inflammation the percentage of post-operative adhesions or other unexpected sequelæ ought to be very low. In this work the following principles should obtain:—

1. Speed with security.
2. A minimum handling of the bowel.
3. A covering of raw surfaces by peritoneum.
4. The avoidance of contaminating the field with septic material, or otherwise.

A method which is simple, accurate, rapid, gentle, and secure is the one to be selected.

Treves, in 1887, when he closed the stump of the appendix with two initial sutures and stitched a flap of cecal peritoneum over the stump, seems to have initiated the idea of protecting the peritoneum from subsequent adhesions due to the leaving of a raw surface. He stated that he considered this safer than to ligate and drop the stump back into the abdomen, as was done by his predecessors.

Dawbarn, in 1894, inverted the stump of the appendix by purse-string without first ligating, using a forceps to crush and a cautery or carbolic acid and alcohol to sterilize.

Deaver condemns the Dawbarn method of simple invagination without ligation, as he reports several cases of bleeding from the cut



surface of the stump of the appendix. He also condemns any method which advocates the complete excision of the base of the appendix from the cecum because of the unnecessarily increased size of the wound in the cecum, with the resulting danger from contamination and consequent infection.

Le Bec treats the appendix by a circular cuff stripped down to the cecum. Then he ligates with catgut, cuts with thermo-cautery, cauterizing thoroughly, ligates the peritoneal cuff over the stump with catgut and drops it back into the abdomen without invagination. He considers a purse-string unnecessary, as the thermo-cautery protects against infection, and the ligation of the peritoneal cuff protects against raw surfaces.

Paul Delvert states: "I am absolutely hostile to the practice which allows the stump to lie free in the abdomen. The mucous membrane, if not inflamed, is infiltrated with germs, and their dangers are evident. It is, therefore, not useless to spend the extra time needed to introduce the purse-string."

Hessert reopened the question of danger from hemorrhage from the stump if left unligated. He reports 3 cases of post-operative bleeding from the stump, with one death. Anatomically, according to Hessert, in 5 per cent. of the cases the blood-supply to the base of the appendix is derived from the cecal circulation and not from the mesoappendix directly. He argues that unless a ligature is passed around the stump where this 5 per cent. anomalous circulation occurs, a purse-string does not secure hemostasis.

Harris, having observed this same arrangement in the circulation, prevents this hemorrhage by an independent ligation in every case on the meso-appendix side at the cecal level, deeming it unnecessary to ligate with this extra precaution utilized.

Ochsner uses the Harris method, and reports 2,000 cases with no post-operative hemorrhage.

Murphy crushes, ligates, treats with carbolic acid without neutralizing, and buries in wall of cecum with purse-string.

Wyeth ligates and drops back without purse-string.

In the Report of the Presbyterian Hospital of New York on operative mortality in 512 cases operated upon for chronic appendicitis, there were 3 deaths: 2 unavoidable, and one, which occurred on the fourth day, from general septic peritonitis, due to the ligature slipping off the stump of the appendix. In this case a ligature had been passed around the stump of the appendix, and there was no subsequent burying of the stump. The report continues, stating that a number of cases have been reported from other clinics where the ligatures had slipped from the stump, with subsequent death, and quotes from the Mount Sinai Hospital Reports of New York, that in a series of 2,000 cases this accident occurred twice.

Deaver condemns dropping the stump back without inverting,

and reports having seen obstruction due to adhesions between the stump of the appendix and another part of the bowel, where the stump had been merely crushed or ligated and not inverted.

The first record of this manoeuvre seems to be the old cuff, with which most of us are familiar. Then comes the purse-string, which begins at the meso-appendix, encircles the appendix with bites in the wall of the cecum, and is closed after the stump has been depressed into the loop.

Barrett advocated a subperitoneal loop for ligating the vessels, and an ordinary purse-string to cover the raw surfaces, with a specially devised depressor.

A number of other men subsequently suggested ingenious schemes for the treatment of the stump, to eliminate the dangers from bleeding surfaces, but all are based on the possession of some special instrument.

In 1913, coincidentally, three articles appeared in different journals, two in January and one in April, advocating the principle based on the suggestion of Lembert for peritoneal approximation. The first of these three articles was published by the writer, and its description follows:—

The suture, preferably linen, is begun at the mesenteric side of the appendix, a bite being taken to include the vessel near the base and continued away from the mesentery, far enough from the base of the appendix to insure a pocket in the cecum sufficiently large to hold the stump. Bites are taken in the wall of the cecum at points which may be illustrated by using, for instance, the numerals on the face of a watch as a guide for introducing the suture, taking twelve o'clock as the mesenteric side and introducing the needle, pointing it away from the mesentery at twelve o'clock, ten, two, eight, four and six o'clock. The free ends of the suture are drawn and the stump of the appendix automatically disappears, without the aid of a depressing instrument, and with no danger of breaking the suture. The free ends of the suture are next tied, and the purse-string is completed with a sufficient number of approximating points to insure good coaptation.

We may draw the following conclusions: To insure success with the lowest possible mortality and the least chance of post-operative complications, the following principles should prevail:—

1. The prevention of hemorrhage by (a) the actual cautery when available; (b) the ligation of the vessels; (c) the use of formaldehyde, as is done in many clinics; or (d) the ligation of the stump. The latter, however, might become the origin of an abscess in the cecal wall because of septic mucous membrane left in a pocket.

2. The prevention of general peritonitis by invagination which avoids danger from access of intestinal contents to the free peritoneal cavity, by the slipping of a ligature off the stump.

3. The prevention of adhesions between raw surfaces by turning the stump into the cecum.
4. The selection of a simple, safe, and rapid method of purse-string, which does not necessitate the use of specially devised instruments.
5. The adherence to one simple plan to establish a good habit.

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REPORT OF A CASE WITH AN OPEN SAFETY-PIN IN THE  
ESOPHAGUS.

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By EDWIN A. MERRITT, M. D., of Council Bluffs, Iowa.

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The patient, Baby McS., *æt.* two years, referred by Drs. M. A. Tinley and Donald Macrae, Council Bluffs, September 30th, 1914.

*History.*—On the afternoon of September 30th, while playing on the floor, the child placed the open pin in its mouth, and before the mother could prevent, had swallowed it. The child was taken immediately to Dr. M. A. Tinley, who suggested conservative measures and advised that the case be taken to Dr. Macrae for further observation. Dr. Macrae referred the case to the writer, with the suggestion that the patient be carefully observed and roentgenograms made as indicated.

The first roentgenogram was made about two hours after the ac-



Fig. 1.

cident (Fig. 1). This revealed the pin in the esophagus at cardia, point downward to left.

The child was quiet, in fact slept while being transported to hospital and while there. The parents were advised to feed the child liberally with mashed potatoes and give a bedtime dose of castor-oil. The following morning, eighteen hours after the pin had been swallowed, another roentgenogram was made, locating the pin in the gas bubble of the stomach (Fig. 2). Preceding this roentgeno-

gram, a small amount of bismuth and milk was given, with the idea of outlining the stomach. Mashed potatoes and castor-oil were again given, the former in as large quantities as the patient could be induced to take.

The following morning, or forty-two hours after the accident, the third roentgenogram located the pin in the sigmoid, and two



Fig. 2.

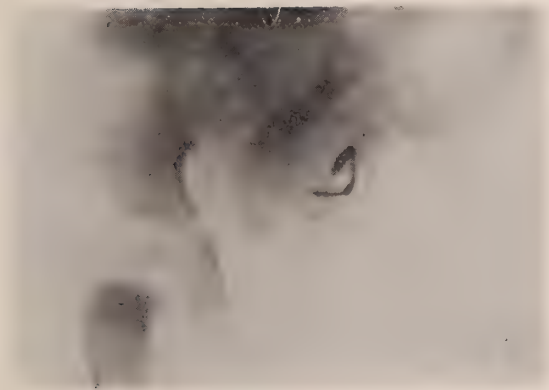


Fig. 3.

hours later, the pin was brought to the writer, it having passed without difficulty.

During the forty-two hour period, the child ate, played and slept as though the open safety-pin constituted a part of its regular diet.

*Summary.*—The writer had not intended to report this case, but a similar case reported by Mackenzie, in the JOURNAL for October,

1914, prompted him to do so, inasmuch as his case died, following unsuccessful attempts to remove the pin by way of the esophagus.

Two similar cases have come to the writer's knowledge recently, one in which the pin passed in the natural way without trouble and the other in which death followed a laparotomy, performed to remove an open pin from a child's stomach. In both these cases there were no symptoms.

The results, in the case referred to him, are to the writer's mind a final and conclusive argument against all forms of early spectacular operative interference in similar cases.



## GONORRHEAL RENAL INFECTIONS. A REPORT OF TWO CASES. TREATMENT AND RESULTS.

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By FRANK B. HOOVER, M. D., of Memphis, Tenn.,  
Urologist to the Memphis City Hospital.

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The number of cases of gonorrheal renal infection reported to date is very few.

Referring to an article by Dr. Louis C. Lehr, of Washington, D. C., which was read before the American Urological Association in New York in 1912, we read that the cases reported to that date numbered about 20. "In 5 the gonococcus was obtained from the voided specimen. In 2 the pyelitis was due to a mixed infection; in 4 no cultures were obtained; in one a nephrectomy was done and the diagnosis was made from the removed specimen. In 4 the disease was recognized at autopsy. In only 4 were cultures obtained from the kidney during the course of the disease."

In this article Lehr reports one case, and one other case report came to the writer's notice last year, the author of which he is not able to recall.

If the writer is correctly informed, then the cases that have been reported so far are less than 30, and the cases in which cultures were obtained from the kidneys during the progress of the disease are only 6.

The writer truly believes that this number falls far short in representing the number of cases that have presented themselves for treatment. Further, that if each case of gonorrhea persisting beyond a reasonable period (if on proper treatment, and especially those cases presenting vague back pains which are so often attributed to the prostatic or seminal vesicular involvement) were investigated for involvement of the upper urinary passages, we would have a large increase in the number of this class of cases appearing in our future literature.

It was the writer's searching for additional colon bacillus renal infections that led to the diagnosis of the first case. The second case consulted him within the next few days.

The treatment in these cases was done entirely in the office, both patients suffering practically no inconvenience and being able, as soon as the treatment was finished, to leave the office and go about their business. The report of the writer's 2 cases follows.

Case I.—B., white, male, *aet.* thirty-five, single; occupation, dentist. Patient consulted the writer on August 9th, 1913, giving a negative venereal history until five years ago, no other illness that could have a bearing on this

trouble being reported. Five years ago patient contracted gonorrhea. He is unable to remember what sort of treatment he received. At the third week both epididymi became involved, confining him to bed for six weeks. Ever since this the patient has been able to detect a small morning drop. About one and one-half years ago he complained of dull pain over both kidneys, never of a distinctly radiating character, but severe enough to cause him to give up his practice. Recently patient has noticed pain only in the left kidney region, this occasionally radiating to the left testicle. These radiating pains, however, were not at all severe and caused no desire to urinate. Until last year patient has been bothered with night urinations; since then, however, this has ceased.

There has been no copious discharge, but a persistent morning drop has been present and patient has been able to milk out a scant discharge mostly any time in spite of the fact that he has been under almost constant treatment of various sorts including prostatic massage, sounds, dilatations with a Kollman dilator, irrigations and instillations.

Now patient complains only of persistent gleet discharge and occasionally the pain in the left kidney region. Examinations revealed a scant watery urethral discharge which in the stained smear showed only colon bacilli, no gonococci being seen. The testes were normal size and not tender. Both epididymi were slightly indurated. The prostate was very slightly enlarged, somewhat elastic, but not tender to touch. The prostatic secretion in the stained smear showed what resembled colon bacilli but no gonococci.

The kidneys showed no tenderness on pressure and were not enlarged. The writer decided on a bladder culture and cystoscopy, and because of an extremely small meatus did a meatotomy.

On August 13th, a bladder culture was taken after the urethra had been thoroughly irrigated and a cystoscopic examination made. Cystoscopy revealed a slight general blush of the bladder mucosa—a more intense hyperemia in the region of the trigone. No ulcerations and only slight trabecularization. The ureteral orifices were moderately congested. During the cystoscopy some pus flakes appeared in the solution in the bladder, although the urine spurt from either side was apparently clear, with no indication of pus.

The bladder culture revealed multiple groups of gonococci. A deep stricture prevented the passage of the catheterizing cystoscope; hence for the next four days sounds and protargol instillations were instituted. Then both kidneys were catheterized after a very careful bladder lavage, and cultures were made on blood serum, ascitic agar and ordinary media. The culture report showed in the right kidney numerous gonococci and a few colon bacilli; left kidney, a few gonococci and numerous colon bacilli. It may be well here to remind the reader that the left side, the one showing numerous colon bacilli and few gonococci, gave all the pain of late and that the other, the right side, with many gonococci and only a few colon bacilli, had produced no pain. On August 22nd, kidney treatments were commenced.

Both kidneys were catheterized with a No. 6 catheter, care being exercised to enter the orifices deliberately so as not to drag the catheter tips across the bladder mucosa. The pelvis were then filled with 2 per cent. sterile boric acid solution and allowed to empty, this being repeated until the return solution was perfectly clear; then each kidney pelvis was filled with 5 per cent. argyrol solution by very slow injections through the catheter to the point of producing a pain sufficient for the patient to tell the writer which kidney he was injecting. This point was reached on either side in the first treatment when 4 c.cm. had been injected. The catheters were now immediately withdrawn. No reaction followed this procedure. These treatments were given every second or third day.

Between these kidney treatments, two treatments daily were given. On every second day for one treatment, the prostate and seminal vesicles were stripped and massaged and a deep protargol instillation given. The other treatments consisted of a 1:5000 permanganate of potash bladder irrigation. On August 24th the writer irrigated the kidneys and injected 8 c.cm. of 5 per cent. argyrol into the left pelvis and  $7\frac{1}{2}$  c.cm. into the right.

On August 27th, 6 c.cm. were injected into each pelvis. August 30th, cultures were taken from both sides and 6 c.cm. argyrol injected in either side.

The report on these cultures showed the left kidney culture sterile after seventy-two hours' incubation, the right kidney showing a few gonococci and a few staphylococci albi, the latter probably being a contamination as it did not show up later.

On September 2nd, only the right kidney was irrigated and injected with  $7\frac{1}{4}$  c.cm. 5 per cent. argyrol.

On September 5th, a culture of this kidney was taken and 8 c.cm. argyrol injected. Culture report showed a sterile urine after seventy-two hours' incubation.

On September 7th, one shread appeared in the first glass of urine; the second glass was clear. In the stained smear of this shread a few gonococci and colon bacilli were seen. The writer then ordered a 1 per cent. protargol hand injection to be used three times daily and retained ten minutes. From this date on, prostatic massage, instillations and bladder irrigations were continued.

September 14th, a very scant discharge was present, but examination of stained smears of this and the prostatic secretion showed no germs and only a few pus cells.

September 16th, a culture of the prostate was made and the tubes were negative.

September 18th, the urethra was dry, both glasses of urine sparkling, showing no shreads or specks.

Urine examination showed 1,010 specific gravity; acid reaction. A very faint trace of albumin with heat and acetic acid; no blood. Microscopic examination showed only occasional white blood cells and no casts.

All treatment was stopped and the patient immediately left for his home.

*Final Examination.*—Prostatic and bladder urine cultures showed no gonococci. At his request kidneys were catheterized and cultures made. The report reads: The case of Mr. — shows after seventy-two hours' incubation no growth in either right or left tubes.

Case II.—B., white, male, *aet.* forty-one years, married; occupation, merchant. Consulted the writer August 19th, 1913, giving a negative venereal history up to eighteen years of age. At this age patient contracted gonorrhea which lasted about two months and was treated with bladder irrigations and given a hand injection. Quickly following this attack a stricture developed, being dilated with sounds for six months. Sounds one year ago detected no stricture. Patient married at the age of twenty-three. Three children have been born, two before and one since his last infection occurred, which was six years ago. The wife's history, according to the patient's statements, is negative and shows no signs of an infection (a protection being resorted to on all occasions excepting when the last pregnancy developed).

With this second infection patient decided to treat himself and says he used "Big G" and everything anybody suggested whenever the discharge would get at all profuse.

About four months after this infection occurred, he developed a right-sided epididymitis with which he was confined to bed for about a month. Only hot applications were used. After this the case ran along with only the constant scant discharge for two years, when a recurrence of the right epididymitis occurred, again confining him to bed for a month. Ichthylol applications, hot



applications and internal treatment were given. During and following both these attacks, for about two months, patient complained of bilateral pains which radiated from just above and posterior to the anterior superior spines down to the testes, these pains causing a desire to urinate; also at times he said he had vague back pains which he attributed to rheumatism. Ever since, a morning drop has been in evidence following any drinking or intercourse, and only drying up occasionally for short intervals when some astringent was used.

About a year ago he was treated with prostatic rubs, sounds and irrigations and told he was well, but the discharge persisted after this.

Patient has never been bothered with night urination. No backache or radiating pains have been present of late. On examination a scant watery discharge was found which in the stained smear showed colon bacilli but no gonococci. The right epididymus was slightly indurated. The left side negative. The kidneys were negative to palpation and pressure. The prostate was a trifle enlarged and a bit elastic. The right seminal vesicle was barely palpable. The left could not be felt. August 19th, cultures were taken from the bladder urine by catheterization and from the expressed prostatic secretion. These cultures showed only gonococci in the prostate and gonococci and colon bacilli in the bladder urine. Cystoscopy revealed a very slightly trabeculated bladder, a slight blush over the entire bladder mucosa with some slight engorgement of most of the surface vessels. The left orifice looked normal, but the right was congested and the mucosa immediately surrounding it was red.

August 22nd, double ureteral catheterization was done for a diagnosis by culture, and 5 per cent. argyrol injected just on suspicion. The culture report showed the urine from the left kidney sterile, and only gonococci in that from the right. August 25th, a right kidney lavage was given and 6 c.cm. 5 per cent. argyrol injected.

August 26th and 27th, a bladder irrigation of permanganate of potash solution. August 28th, another treatment was given the right kidney and 6 c.cm. argyrol injected. August 29th and 30th, bladder irrigations. August 31st, a culture was taken of right kidney and 6 c.cm. argyrol injected. This culture was sterile after forty-eight hours' incubation, culture made on ascitic agar. From this date until September 16th, patient was given a 1 per cent. protargol hand injection to use and a daily office treatment given. Permanganate of potash irrigations one day and a prostatic rub and protargol instillation the next. September 16th, a bladder urine culture was taken which showed Gram positive diplococci and no other growth. The writer considered this a contamination, but for safety's sake, on September 19th, irrigated the bladder thoroughly and injected 40 c.cm. of 5 per cent argyrol which was retained several hours until voided.

September 22nd, a final double catheterization was done for cultures, and these showed a sterile urine in both kidneys after forty-eight hours' incubation. Following this the writer advised a rub and instillation every second day to tone up the prostate further. Repeated examinations of prostatic secretion revealed no germs. Patient was discharged October 9th, 1913, the urethra having remained dry for nearly three weeks. He resumed drinking and intercourse and reported frequently with negative findings. November 7th, at the writer's request, he came for examination and reported having drunk heavily the night before. The urethra was dry. The urine voided was cloudy. Reaction, alkaline; specific gravity, 1,008. The cloud in the urine disappeared on the addition of dilute acetic acid, showing this was due to phosphates probably brought on by his previous night's excess. No shreds or specks were detected. Albumin test negative; blood test negative; micro-

scopic examination revealed (1) numerous amorphous phosphates; (2) about one pus cell to the low power field; (3) no red blood cells; (4) no casts. In both these cases a mild urinary antiseptic was given internally more or less constantly. No vaccines were administered. All cultures were made and reported on by Dr. Wm. Krauss, of Memphis.

These 2 cases, one a combined gonorrheal and colon bacillus infection of both kidneys as well as the lower urinary tract, the other a pure gonorrheal infection of the kidney (unilateral) but a combined gonorrheal and colon infection of the lower urinary tract, tend to show us

(1) The length of time these cases may persist, one five years, the other six without giving rise to any distinct severe symptoms referable to the kidney.

(2) The persistence of the urethral and prostatic symptoms in spite of treatment so long as this was confined to the lower urinary passages, but the rapidity with which these parts were cleared up once the renal infection had been cured.

(3) The finding of no nephritis as well as the rapidity with which these cases cleared shows the infection was confined to the pelvis.

(4) The tendency for the colon bacillus to present itself in the course of chronic gonorrheal cases.

(5) The rapid results obtained in the writer's 2 cases from injections of argyrol in amounts only sufficient to fill the pelvis.

(6) The harmlessness of this drug in 5 per cent. solution as shown by final urine examinations.

828 Exchange Building.

## THE TRAINED NURSE AND THE GREAT MIDDLE CLASS OF THE PEOPLE.\*

By ARTHUR M. CORWIN, A. M., M. D., of Chicago.

All who are familiar with the evolution of nursing in Chicago and, indeed, in the whole country, are familiar with the winning personality and leading influence of Harriet Fulmer, and so I am honored in her invitation to speak to you. This is not flattery but an expression of my own appreciation of her work. A bit of honest commendation given to people while they live is worth more than a whole cemetery of inscribed marble and roses after they are dead. And the habit of free-hearted eulogy of men and things of merit is a good one to cultivate.

I am not here to settle a question which for decades has claimed your earnest attention, but as one who from twenty years of active contact with medical practice is interested in its many phases and problems.

To sum up the salient points of the subject and emphasize certain of them will perchance start discussion worth while. Briefly put is the postulate that the rich are well provided for medically. They have only to order what they please, when they please, how they please. They buy climate as easily as they do postage stamps. The best of hospitals, sanatoria, medical and surgical service and the service of the most efficient nurses is theirs. The poor, also, are more and more efficiently entertained, nourished and nursed by the open purse of organized charity; but the self-respecting, honest, independent, self-supporting average citizen who is the backbone of our population and the hope of our institutions is not so well provided for. When suddenly cut down by sickness or accident he is undone in short order. If we recommend for him a hospital, an expensive specialist, or a health trip, or advise the services of an R. N. to be continued any length of time, he simply throws up his hands. He cannot afford to buy the prescription. That family of his needs a trained nurse in case of his typhoid or what-not, but her twenty-five to thirty-five dollars per week means the mortgage of his future if not of his house.

But, I hear you ask, What have we do with this problem? We are expensively and highly trained for special service at returns which are none too large. If the great financially half-washed,

\*Address to St. Luke's Hospital Nurses Alumnae Assn., September 22nd, 1914.



like the great unwashed, need more or less of a bath let them find it out and get it themselves. We hard-working nurses have enough to think about. And the physician might say the same, except that to him the problem is more acute; for the variety and multiplicity of cases needing expert nursing but unable to buy it come many times to his door and he is sore distressed. True, the duty of each man or woman to earn an independent living is of first importance, but no one can live unto himself alone unless he live like Robinson Crusoe, who for awhile was the whole of society, civilization and government upon his little island. His rights were as broad as his horizon. His obligations were to nobody but himself. But when he discovered the footprints of good man Friday on his sands, just there his rights and freedom were cut in half, and his obligations doubled. So we who live in Chicago must multiply our obligations by two million and a half and divide our rights by the same number. When we have done this intellectually we have just begun to live. So it is apparent that if the public needs something of which we are best informed, it is eminently our duty to assume leadership and set about an educational propaganda that shall make that public back up our efforts for its own good. To this end it is high time for the representative members of the medical profession to co-operate with the leaders of the sister profession, get together in open forum, discuss and plan what best to do.

Let us make plain another fundamental proposition. You *alumnæ* of St. Luke's stand as do we for all that means the uplift of both professions. We have fought for higher standards of preliminary education, efficient, high-grade instruction upon the basis of a wise and progressive curriculum. We have clamored for strict surveillance through efficient laws of registration and control. We want one common door through which all graduate, registered nurses shall enter the profession; one door through which all physicians shall enter the practice of medicine. We want no roundabout route by which any may climb over or crawl under or through some hole of special privilege or false pretense.

Richard Cabot more than any other has reformed the dispensary and hospital idea, so that their attending staffs shall more and more look at every patient as a member of some family and of the community, and not merely as a fair field for the display of surgical technique, an interesting specimen for clinical exhibition to be dismissed at the end with a Latin formula. Social service is to be installed in the formula *medicamentum* of the future. It is the emphasis of this in private practice that brings nurse and doctor together for the solution of this problem, for the service of the nurse and the service of the doctor are wrapped up in the need of the patient in all his relations, social, economic, moral and cultural.

Upon the basis of such an understanding we physicians and nurses are ready to look at any problem from the same point of view; and, by the way, in the attainment of our ends there shall be in the future as in the past numerous foes to overcome; but since phagocytes were put into the blood of humanity there is that within us that responds to the call of a good fight.

The need of the great middle class is real—you can all multiply examples innumerable. How shall we meet it?

1. Make a sliding scale of prices, as do physicians? They all temper the financial wind to the shorn lamb, and are lucky even then if they get a small fee. Emphatically no. Such a proposition is not to be entertained for a minute. If anyone earns twenty-five to thirty-five dollars per week on the average, it is the fit, well-equipped, trained nurse. Easy cases, if there are any, and hard cases, of which there are many, altogether give a composite of arduous demands upon the mentality, physical strength and sympathies of a nurse that merit her pay in full. Her compensation is none too large to cover enforced vacations between cases and the need of rests because of the stress of her work. The rigid enforcement of her schedule of fees is just and proper.

2. Some local associations, as that at Cincinnati, have inaugurated a plan by which each nurse upon registration signifies willingness to donate her services free for a number of weeks each year. She specifies the character of the work. If she is called to a pay case during such free service, she is relieved by another. This is a voluntary, systematic charity and not fee reduction.

3. Then there is the plan of hourly nurses for a given fee whereby skilled attention for one or two hours a day may be purchased in certain cases not absolutely dependent upon continuous care. Such cases are numerous. This plan, properly worked out through the organization of a bureau and with proper districting of effort so that a single nurse can attend several compatible cases with the least loss of her time, has been tried successfully. This hourly system is in vogue with certain nurses in Chicago, but not in operation through channels of organized effort. Such a system would, if well worked out, pay the nurses handsomely without interfering with the continuous duty service. It would in large measure help to solve the riddle before us.

4. Again, endowments to make available expert service to the class we are considering is in this age of the ubiquitous multi-millionaire worth encouraging. It is as reasonable to establish such endowments as for other purposes, and under it the regular fee could be maintained. For example, Valmora Sanatorium for tuberculosis near Watrous, New Mexico, was established a number of years ago by some thirty odd Chicago firms and has successfully provided the best of treatment and climatic influence for a very

moderate sum, eleven dollars a week for employes of supporting firms, thirteen dollars for outsiders. The results attained have amply justified the foundation, for cases are saved with a speed and certainty not to be obtained in the outdoors of lower altitudes.

5. The endowment idea may be expressed in another form, through mutual insurance; the public bets upon its health for so much per year and if it loses the premium bet it receives ample recompense in the skilled service of a nurse. This idea formulated upon sound, actuarial principles will also relieve the situation, but the public needs education in this direction. This plan of insurance should be formulated upon better lines than those which have been adopted in some cases of industrial insurance for medical service, since here the meagre pay of the contracting doctor belittles his profession, prostitutes his self-respect and degrades the opinion which the public finally comes to hold toward the medical profession. For this condition physicians themselves are largely to blame because of individual selfishness and want of co-operation in organization. Let nurses avoid a similar degradation of their services and their remuneration by loyalty to their group conscience.

6. The undergraduate nurse employed in hospitals and sanatoria and trained to expert service under the supervision of her seniors is in her proper place when she is put upon private special cases with the full understanding of the public that she is an undergraduate. But when she is given the sole care of a case inside or outside such an institution under the impression on the part of the patient or his family that she is a graduate nurse, the principle is wrong. Her services in such event, paid for at the usual high rate, too often merely swell the purse of the hospital, while the public is cheated of what it thinks it is getting.

7. The 'practical nurse,' so-called. There is great need for various grades of helpers in the house of sickness. Often a strong, wholesome individual with the rudiments of knowledge in the care of the sick, handy in the kitchen, diplomatic in the herding of children, and effective in meeting the many emergencies that arise in a stricken family is invaluable. There should be an army of such individuals upon call in every community. But these in no sense can usurp the functions of the graduate trained nurse, and should not be allowed to compete with her. It would seem only fair that the regimentals of the graduate, registered nurse, her badges, buttons, pins and the like, should be fixed and protected by law as is her diploma, in order that no impostor may pose as a member of her class. The red cross has already been so protected. The public needs persistent and effective education to know and appreciate her value, and should be widely and accurately informed of the marks by which she can always be recognized. It is a blot upon her fair name and an injustice to her standing that half-baked, in-



competent, quasi-trained nurses can put on vertical stripes (which should really run around them longitudinally) and decking themselves with white caps go forth under the guise of the real article, demanding the regular fee. The nurse of a few months' training with a smattering of facts and experience, perhaps discharged from a school for a cause, is to be found among such impostors. If she wishes to earn her living by attending the sick in some capacity there should be no bar to her so doing, as long as the public clearly understands her status and remunerates her accordingly.

It is a question whether the label 'nurse' should not be strictly confined to the graduate, registered nurse, all others being designated by some other term. At all events, adequate differentiation should be made between the several grades of attendance upon the sickroom so that the people may employ whom they choose and know what they are paying for.

By the above means carried to greater perfection, especially the hourly system, the problem of how the great middle class is to obtain the good service of nurses can be practically solved. The splendid growth which your profession has made though still in its infancy, is a sure guarantee that it will in time fully meet the difficulties in question. But a better co-operation between nurses and physicians, which we have already called attention to, is essential to speed the necessary reforms.

25 East Washington Street.

# MEDICAL AND SURGICAL PROGRESS.

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## COLON BACILLUS PYELITIS.

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### A REVIEW OF RECENT LITERATURE.

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By HERMAN L. KRETSCHMER, M. D., of Chicago,  
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Infections of the renal pelvis and kidney by the colon bacillus have received much clinical study during the past few years, as is evidenced by the enormous literature on this subject. This widespread interest is due to many factors: First, to the fact that this condition interests not only the genito-urinary surgeon, but also the pediatrician, obstetrician, gynecologist and internist; second, to a more careful bacteriological study of urinary cases; and third, to the general interest in vaccine therapy.

#### ROUTES OF INFECTION.

One of the most interesting phases of this subject has been the route traveled by the colon bacillus in getting to the kidney. Some of the publications of to-day and nearly all articles on this subject up to a few years ago gave the following three routes: by the blood-stream, the urine, and contiguity of tissue.

The most important contribution on this phase of the subject is the article of Francke, who made an extensive study of the lymphatics of the large intestine. He was able to show, by injected preparations, that the lymphatics of the end of the transverse colon, splenic flexure, descending colon and part of the sigmoid pass over or across the capsule of the left kidney. By means of his preparations, he further demonstrated that the lymphatics of the cecum and ascending colon pass over the capsule of the right kidney. In some of the cases he was able to inject the lymphatics over the right kidney from the appendix. According to Stohr, the lymphatics of the kidney capsule communicate with the deep lymphatics of the kidney, so that there exists on the right side, and probably on the left side, a direct communication between the lymphatics of the large intestine and the kidneys.

As further proof of the clinical significance of his findings, Francke quotes the work of Krymow, who demonstrated, by injecting the cadavers of children, three lymph-nodes in the fatty capsule of the kidney. These same three glands he found diseased post-mortem in eight children who had *tabes mesenterica*.

These interesting facts naturally raise the question of the relation which might exist between lesions of the intestinal tract and *B. coli* infections of the kidney. Asch reports 4 cases, two males and two females, who were suffering with chronic obstipation, and who had pure cultures of colon bacilli in their urines. Treatment of



the constipation was followed by a complete cure, without the use of urinary antiseptics or local treatment.

Many authors believe that intestinal disturbances are important predisposing factors. Thus Klowitz, in 34 cases, found a history of alimentary disturbance. Mayer also believes that many of these cases follow acute gastro-intestinal disturbances. Similar views are held by Trump, Oerm and Bahr, Rolly, Jeffreys, Friedenwald, Smith and Wilson.

The rôle played by gastro-intestinal lesions in the production of metastatic colon bacillus infections is illustrated by the case of Tavel, who had operated on a patient for goitre. After the operation there occurred an infection of the wound with colon bacilli, the patient having had a very severe gastro-enteritis. Tavel was able to prove his deductions by animal experiments.

The theory that colon bacilli are transplanted via the blood-stream is the belief of many, although it has been possible to isolate the bacilli from the blood in comparatively few cases. Ayers believes that infection by the blood-stream is the rule in nearly all cases, and Klowitz states that this affection is essentially blood borne in origin. Bloch classifies colon infections into primary or hematogenous, under which he includes colon pyelitis of pregnancy and childhood, and secondary or ascending infections.

Mayer in some of his cases found colon bacilli in the placenta and in the heart's blood of the fetus.

The number of cases of colon infection recorded in the literature are many; the cases in which the bacilli have been isolated from the blood are very few. Widal and Benard report 2 cases of pyelonephritis of pregnancy in which they isolated colon bacilli from the urine and blood. Agglutination phenomenon demonstrated that the bacilli in the urine and blood were identical. Similar cases are reported by Blumenfeldt and Hamm, and Panton and Tidy.

The ascending route of infection has been recognized for a long time. This has usually been inferred to occur directly along the mucous membrane of the ureter from the bladder to the upper urinary tract. In these cases, the bacilli pass directly from the bladder into the kidney via the mucous membrane.

It has been proved experimentally by Goldschmidt, Markus and others that under certain conditions an antiperistaltic movement may take place in the ureter, so that the contents of the bladder can be propagated into the kidney, and that a partial filling of the bladder is sufficient to dissipate the closure of the ureteral orifice, so that each variation in the intravesical pressure is transmitted to the renal pelvis (Graff). If ulcerative processes are present in the ureteral orifice, so that the opening gaps, or if a chronic retention exists, *e. g.*, prostatic hypertrophy, lesions of the central nervous system, etc., the ascending infection can easily be explained.

That ascending infections do not always follow the mucous membranes, but that they may reach the kidney from the bladder through the lymphatics, is proved by the magnificent work of Bauereisen, who demonstrated that a direct connection of the lymphatics of the bladder and kidney exists through the lymphatics of the ureter. This no doubt accounts for many of the cases of ascending infection from the bladder to the kidney without an involvement of the ureteral mucosa.

There still remains a small group of cases in which the infection

may be explained by contiguity of tissue. Although this mode of infection finds few supporters to-day, it is given space in the writings of Andrews, Mackey and others.

#### PREDISPOSING FACTORS.

*Sex.*—By far the larger number of authors state that females are more frequently affected than males, some of the more recent articles showing a great preponderance of females over males. Thus Thompson found 79 per cent. in girls, Still, 90 per cent., Hatch, 80 per cent., and Marsh, 90 per cent. That boys can be affected much more frequently than was formerly supposed is evident from the recent articles of Klowitz, who reports seventeen boys and twenty-three girls. This supports the views of some of the earlier publications on this subject, which gave figures higher than were generally quoted at that time: Goppert, 11 per cent., Friedenwald, 27.5 per cent., and de Lange, 33 per cent. in boys.

The great preponderance of girls over boys was explained because of the short female urethra, and carelessness in cleaning infants with the diaper by wiping forward. These statements do not explain all cases.

*Matrimony.*—Colon pyelitis occurring in newly married women has been termed 'defloration pyelitis' by Wildbolz. This type of colon infection has been described also by Rovsing and Sippel. In some of these cases there may or may not be a coexisting involvement of the bladder. Wildbolz believes that a possible factor in the production of defloration pyelitis are tears of the hymen.

*Pregnancy.*—That colon pyelitis is a frequent occurrence during pregnancy is a well-recognized clinical fact. Careful study of many cases of unexplained fever, albuminuria and pyuria, occurring during pregnancy, has revealed the fact that they are due to colon bacillus infections. Rosenfeld states that all cases of fever occurring during pregnancy without an apparent explanation call for careful urinary analysis.

Not only have these studies given us a better understanding of these complications of pregnancy, but they have revolutionized their treatment.

Various theories have been advanced to explain this occurrence during pregnancy. Many authors are of the opinion that the pyelitis occurring during pregnancy is simply a lighting up of an old infection which the patient had during infancy or childhood.

From the many theories advanced it is most probable that any one does not explain all cases. Compression of the ureter by the pregnant uterus or fetal parts has been one of the more frequent reasons given. Veith does not believe the uterus is capable of this, and Reed calls attention to the occurrence of pyelitis during the early part of pregnancy, before the uterus is large. This is the view shared by Francke, who says that if the theory of ureter compression by the pregnant uterus is correct, this condition should be more frequently found associated with fibroids, ovarian tumors, etc.

The element of dilatation doubtless plays some rôle. Just how much of a factor it is, would be difficult to estimate. It is a well-known fact that dilatation of the upper urinary tract occurs frequently during pregnancy, and probably plays a predisposing rôle. According to Hirsch, dilatation can be demonstrated in about 30 per cent. of pregnant women.

Associated changes in the pelvic organs may at times be factors in the production of this trouble. Mirabeau believes that changes in the bladder mucosa in the nature of hyperemia and edema may produce a stagnation of urine.

Convelaire is of the opinion that traction downward, produced by the descent of the uterus into the pelvis, is capable of producing ureteral dilatation.

Stoeckel states that an interference with kidney drainage occurs at one of the three physiological constrictions of the ureter.

*Surgical Operations.*—When colon infections of the kidneys occur post-operative, they are usually mixed infections and secondary to involvement of the bladder, although Rawls found *B. coli* only.

*Menstruation.*—Meyer-Betz mentions menstruation as an etiological factor, believing that a period of lowered resistance is present midway between two menstrual periods.

*Pathological Conditions.*—Various pathological lesions are sometimes the real primary condition and the colon infection purely secondary, the more frequent lesions being renal or pelvic stone, hydronephrosis, stricture of the ureter, bladder stone, prostatic hypertrophy, urethral stricture, appendicitis, etc.

*Acute Infectious Diseases.*—Langstein states that pyelitis often follows acute infectious diseases, especially grippe, thereby lighting up an old latent pyelitis. He further states that it can follow pertussis.

#### SYMPTOMS.

The clinical symptoms are very variable. Marsh gives the following classification:—

1. Simple bacilluria in which the urine is acid, clear or faintly opalescent and may or may not have the characteristic fishy odor. On standing, a mucous cloud will form in the meshes of which the bacilli will be found.

2. Cystitis, in which the urine is acid and opalescent, and on microscopic examination it is found to contain numerous motile organisms and pus cells.

3. Pyelitis, in which the constitutional disturbance is greater, with often a high, remittent type of fever. The attack may be ushered in with a chill, rigor, etc.

4. Pyelonephritis, in which the general symptoms are severe, wasting is pronounced, and in addition to pus cells there are casts and albumin in the urine.

Schottmueller, as quoted by an editorial writer in the *Journal of the American Medical Association*, calls attention to a hitherto apparently unnoticed relationship between infections with colon bacilli of the genito-urinary tract of women and herpes of the face, especially the lips and mouth. He observed the occurrence of typical herpetic eruptions in altogether 50 cases of some form of infection with colon bacilli, mostly cystopyelitis, and postabortive puerperal processes. Inasmuch as the cases were observed within a comparatively short time, Schottmueller believes that under certain circumstances colon infections are characterized by facial and oral herpes, which consequently may be of diagnostic significance, especially in pyelitis. Bassler, in an article entitled "Innocent Colon Bacilli in Urines" seems to stand alone in his views, for he states that "one is inclined to assume that a urine containing many



of them (colon bacilli) has a stern pathological importance of genito-urinary interest. That such a urine commonly does have this pathological importance there is no question, but to show that it does not always have it is the purpose of this (Bassler's) paper." Further on he states that there are apparently normal individuals whose bladders are incubators, and whose urines are the media for the proliferation of *B. coli*, which do not seem to do any harm to them, and the presence of which need not concern us very much. His views on the harmless nature of colon infections are not accepted by those writing on this subject.

#### DIAGNOSIS.

An accurate diagnosis must rest on the isolation of the colon bacilli from the urine. The exact localization of the infection must be made by means of cystoscopy and ureteral catheterization. This method is limited of course in children, where ureteral catheterization is out of the question in the very young.

#### TREATMENT.

This can best be considered under the following headings: internal, local, vaccine therapy, and surgical.

The treatment cannot be undertaken in a haphazard way, but must be based on an accurate diagnosis, so that cases with underlying pathological conditions, such as stone, tuberculosis, ureteral stricture, prostatic hypertrophy, etc., are not treated with vaccines or subjected to pelvic lavage, when they should be subjected to the appropriate surgical measures.

*Internal Medication.*—Internal treatment is the one usually first resorted to and is the one on which we are most dependent in children. Of the internal remedies, urotropin or some of its modifications head the list. Walker believes that the urotropin should be preceded by a course of alkalies. Similar views are held by Kidd, Hatch and others. Rawls has given as much as 75 gr. per day, and Ayers recommends from 75 to 120 gr. It is possible that failures are due to insufficient dosage.

Potassium citrate has many advocates as an alkalinizer of the urine, being given preference by Kidd, Burnett, Freeman, Marsh, Hatch, Still, Mackey and others. Hatch sometimes uses ammonium acetate and sometimes sodium benzoate. Broderick uses calcium citrate.

Most urinary surgeons recommend the administration of large quantities of water and milk to increase diuresis. Meyer-Betz takes the opposite view. He believes in limiting the intake of fluid, so as to concentrate the urine, allowing patients an acid diet, phosphoric acid, lemonade, and promoting profuse sweating. Salol is being less frequently recommended than it was formerly, although Rovsing still strongly recommends its use. He gives from 1 to 4 grm. per day with 3 to 4 litres of distilled water.

*Vaccine Therapy.*—Much interest has been awakened in the treatment of this infection by the use of vaccines, preference being given to the autogenous vaccines by most writers. No doubt many of the failures charged to this therapeutic agent are due to improper diagnoses.

Williams, Murray and Wallace state that vaccine treatment is of

pronounced benefit, whereas Klotz thinks it of doubtful value, as does Smith, while Marsh says that vaccines have not yielded better results than the alkaline treatment alone.

Freeman thinks vaccines are especially important in controlling constitutional symptoms, and Rovsing says that it is a method of treatment that cures or gives marked improvement when other remedies fail.

The best results undoubtedly are obtained when the vaccines are used in connection with other forms of treatment. Braasch says that in order to obtain the best results in pyelitis it is best to use all three methods in conjunction—namely, urinary antiseptics, auto-genous vaccines and renal lavage. Similar views are held by Kidd.

Renal lavage through the ureteral catheter is undoubtedly of great value, preferably in combination with the accessory forms of treatment. Silver nitrate, or some of the newer silver salts, enjoy the greatest popularity to-day.

Albrecht, Rovsing, Holweg, Graff, Johanson, Braasch and Cuturi recommend silver nitrate.

Bauereisen, Graff, Kidd, Braasch and Holweg use collargol in varying strengths, some using silver nitrate first, resorting to collargol only when the silver is too irritating.

Ruebsamen still employs protargol and Graff uses it at times instead of silver nitrate.

Harris reports good results from the use of 20 per cent. argyrol. Kehrer has used boric acid, normal salt solution, collargol and silver nitrate. Hartman uses perhydrol in  $\frac{1}{4}$  to  $\frac{1}{2}$  per cent. solution, and Koll reports good results from the use of aluminum acetate. Ayers prefers the use of hot boric solution and nitrate of silver.

Perineau does not advise this form of treatment in acute inflammatory conditions, or in patients in poor general condition.

Drainage of the renal pelvis, by allowing the ureteral catheter to remain *in situ*, is recommended by Bloch and Rovsing. Oppenheimer does not hesitate to leave the catheter *in situ* for fourteen days.

These new modes of treatment have completely revolutionized the treatment of colon pyelitis occurring during pregnancy. Formerly the diagnosis meant the emptying of the uterus. Stoeckel maintains that termination of pregnancy as a cure for the pyelitis is not to be employed.

*Nephrectomy.*—In the acute fulminating type it may appear necessary to resort to nephrectomy. This procedure should be undertaken only as a last resort, after other methods of treatment have failed, and then one should choose very judiciously between nephrectomy, nephrotomy and pyelotomy. Harris reports an interesting case bearing on just this phase of the question. His patient had had a nephrectomy for a severe colon infection of the kidney. Two months later, there occurred a colon infection of the remaining kidney. Instillation of 20 per cent. argyrol into the renal pelvis and internal use of salol and cascara resulted in a sterile urine in ten days.

Rovsing has brought forth a new accessory treatment in these cases. In the obstinate cases he directed the treatment to the bladder, believing that the intervals between urinations allow a growth of bacteria. He drains the bladder with a permanent catheter and allows the urine to flow into a vessel continuously.

## SUSPENSION LARYNGOSCOPY.

### A REVIEW OF RECENT LITERATURE.

By WILLIAM B. CHAMBERLIN, M. D., of the Editorial Staff.

1. Albrecht: The Importance of Suspension Laryngoscopy in Children. (*Archiv fuer Laryngol. und Rhinol.*, Bd. 28, Hft. 1, p. 1, 1914.)
2. Albrecht: The Importance of Suspension Laryngoscopy in Children. (*Verein deutsch. Laryngol.*, p. 138, 1913.)
3. Albrecht: A Modification of Suspension Laryngoscopy. (*Berl. klin. Wochenschr.*, Vol. 44, No. 28, p. 1331, July 8th, 1912.)
4. Davis: Observations on Suspension Laryngoscopy with Notes on a Few Cases. (*British Med. Journ.*, No. 2716, p. 115, January 18th, 1913.)
5. Davis: Suspension for Foreign Bodies. (*Journ. Laryngol.*, p. 206, April, 1914.)
6. Freudenthal: Suspension Laryngoscopy with Demonstration of Method. (*Annals of Otol.*, p. 464, June, 1913.)
7. Freudenthal: Suspension Laryngoscopy. (*Archiv fuer Laryngol.*, p. 459, 1913.)
8. Freudenthal: Suspension Laryngoscopy. (*Med. Record*, p. 329, February 22nd, 1913.)
9. Freudenthal: Suspension Laryngoscopy. (*Trans. Laryng. Rhin. and Otol. Soc.*, p. 131, 1913.)
10. Henrich: Suspension Laryngoscopy. (*Muench. med. Wochenschr.*, No. 48, p. 2666, 1913.)
11. Howarth: Killian's Apparatus for Suspension Laryngoscopy. (*Journ. of Laryngol.*, p. 541, October, 1913.)
12. Howarth: Killian's Apparatus for Suspension Laryngoscopy. (*Proc. Roy. Soc. Med.*, p. 97, April, 1913.)
13. Howarth: Hook Spatula for Suspension Laryngoscopy. (*Lancet*, p. 155, July 19th, 1913.)
14. Iglauer: Foreign Body in Larynx and Trachea Removed by the Aid of the Suspension Laryngoscope. (*The Laryngoscope*, pp. 683 and 706, June, 1913.)
15. Kaempfer: Suspension Laryngoscopy. (*New York Med. Journ.*, Vol. 97, No. 1, p. 21, January 4th, 1913.)
16. Killian: Suspension Laryngoscopy. (*Berl. klin. Wochenschr.*, No. 13, p. 581, 1912.)
17. Killian: Suspension Laryngoscopy. (*British Med. Journ.*, 1181, May 30th, 1914.)
18. Killian: Suspension Laryngoscopy. (*Verein deutsch. Laryngol.*, p. 747, 1912.)
19. Killian: Suspension Laryngoscopy. (*Verein deutsch. Laryngol.*, p. 25, 1913.)



20. Killian: Suspension Laryngoscopy and Its Practical Use. (*Journ. Laryngol., Rhinol. and Otol.*, p. 337, July, 1914, and p. 393, August, 1914.)
21. Killian (*Archiv fuer Laryngol. und Rhinol.*, Bd. 26, p. 277, 1912).
22. Lautenschlagen: Suspension Laryngoscopy. (*Berl. klin. Wochenschr.*, No. 10, p. 448, March 10th, 1913.)
23. Levy: Suspension Laryngoscopy in Children. (*Laryngoscope*, p. 936, 1914.)
24. Lynch: New Technique for the Removal of Intrinsic Growths of the Larynx. (*Laryngoscope*, p. 645, July, 1914.)
25. Mann: Handbuch der speziellen Chirurgie des Ohres und der oberen Luftwege, p. 594.
26. Mayer: Suspension Laryngoscopy. (*Archiv fuer Laryngol.*, Vol. 27, p. 588.)

Just as direct laryngoscopy marked an advance over the older and indirect method, so suspension laryngoscopy marks an advance over the direct methods formerly in use. In the latter case, however, the advance can scarcely be called as epoch making, for whereas the direct method marked the beginning of the investigation of the respiratory tree below the level of the larynx, and the alimentary tract as far as the pylorus, suspension laryngoscopy is but an improvement on the previous direct method in certain advantages of manipulation and in the increased comprehensiveness of the view obtained.

*Description.*—The apparatus consists essentially of two parts, a traveling crane, christened by Killian ‘the gallows’ and suspended from this a hook, armed at its lowermost end with mouth gag, tongue depressor and epiglottis elevator.

The gallows may be attached practically to any table. Its essentials are first a vertical standard, extended into a right angled or horizontal arm at its upper end. The coarser vertical movements are accomplished by moving the standard as a whole by releasing the encircling clamp, the finer by means of the screw at the bottom of the standard.

Motion fore and aft is provided by means of the screw at the end of the horizontal tract fixed to the table. For the comfort and convenience of the operator a table is essential in which the height from the floor may be altered at will.

The second part of the apparatus, or hook, consists of a vertical arm provided at its centre with a screw. Manipulation of this screw straightens or bends this arm as the operator may desire.

At the end of the vertical arm is a mouth gag which may be opened or closed by turning the screw immediately above it in the end of the vertical arm. At the uppermost branch of the gag and at right angles to the vertical arm is a tongue depressor of varying length and provided at its centre with a slot through which the epiglottis elevator is inserted. At the lowermost branch of the gag is a plate for engaging the upper teeth, thus preventing the tongue depressor and gag from sliding out of position. Iglauer has shown by means of radiograms that the “head is supported by the structures attached to the hyoid bone and lower jaw.”

*Technique.*—With the head over the end of the table and supported by an assistant, the tongue depressor is passed well over the

base of the tongue until the heart-shaped tip engages just in front of the epiglottis. By some the tongue is first drawn well forward. Others pay no attention to this feature. Care should be taken, however, to see that the depressor engages the tongue along its median line and that it does not slip to one side or the other. By bringing the vertical arm of the hook well forward toward the operator, the tongue blade is brought more into the horizontal position. The plate for the upper teeth is now engaged and securely locked in position and the mouth gag opened to its fullest extent. At this point, or previously if desired, the upper end of the hook is slipped over the horizontal arm of the gallows, which is adjusted to the desired position. The epiglottis is now elevated by the long spatula slipped through the tongue depressor. This spatula is then locked by a suitable screw.

Illumination is afforded by the Kirstein lamp, an ordinary head mirror, or by means of a specially designed lamp fastened to one of the branches of the mouth gag.

*Anesthesia.*—In suitable cases when the patient is not apprehensive the manipulation is carried out under cocaine alone, by Killian and others. For this, Killian recommends the 25 per cent. spirit solution. It is applied to the base of the tongue, pharynx and larynx, after the previous application of a 20 per cent. aqueous solution. For scopolamine-morphine narcosis Killian proceeds as follows: "Two hours before suspension the patient is given a centigram of morphine and three decimilligrams of scopolamine. An hour later the same quantity of both substances is injected. The operating room is darkened and quiet obtained so that the patient may fall asleep. It is not always successful with this dose, but deep sleep is not altogether necessary. The patient stands the operation quite well if he is merely drowsy. One can carry on a conversation with him and give directions which he readily follows." In addition, the local applications of cocaine to the larynx should not be omitted.

In this country, where patients are universally less tolerant than abroad, a general anesthetic is more frequently used. This is best preceded by an appropriate dose of morphine, one-half to one hour before. Ether seems to be the anesthetic most generally employed, though some still cling to chloroform. At first the anesthetic is given by the drop method. Later, when in suspension and with the mouth gag in position, some form of vaporizer is required. Killian insists upon the necessity of blowing the anesthetic into the mouth under increased pressure, as otherwise too little is carried into the lungs. A general anesthetic is always necessary in children.

*Historical.*—The discovery of the new method was entirely accidental. Perhaps it can best be given in Killian's own words: "In order to obtain for a larger treatise exact pictures of the deeper air-passages, I got my artist, in the winter of 1909 and 1910, to work from the cadaver, as time is usually too short to sketch and paint from examination in the living. We made use of the dissecting-room of the Freiburg Anatomical Institute for the purpose. With the head of the subject hanging over the table and the mouth wide open, a spatula was introduced over the tongue and larynx and the field of view illuminated by an electric hand lamp. It was too fatiguing to hold the instrument until the artist had finished, so I fastened it to an iron stand, which was screwed on to the dis-

secting table. An altogether new situation, *viz.*, the head of the cadaver suspended on the tongue spatula, was produced. By suitable manipulation, and the mouth open as wide as possible, a wonderfully clear view of the whole topography of the buccopharyngeal cavity, of the larynx, and of the entrance of the esophagus was obtained, and I would strongly urge trying this experiment on the cadaver. Many points will be learned which have hitherto escaped notice. The posterior pharyngeal wall appears in its whole length and breadth, from the uvula to the mouth of the gullet.

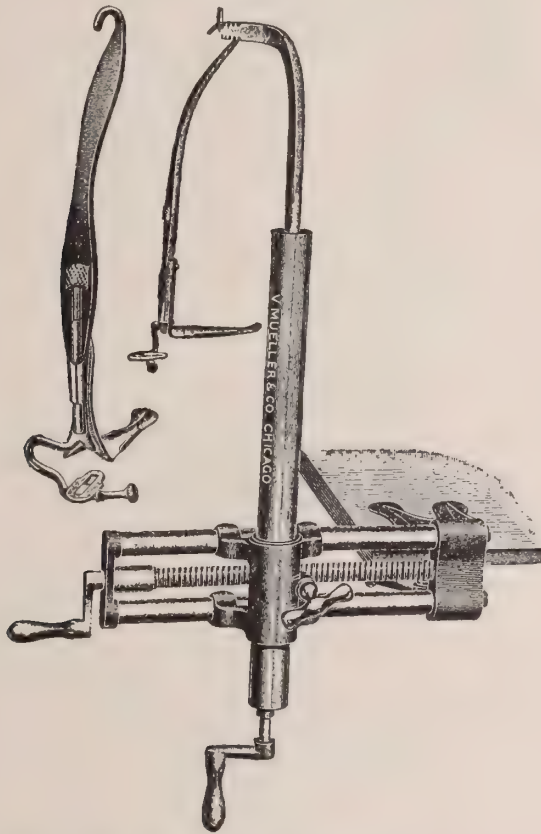


Fig. 1.—Showing track which can be fastened to the side of operating table, together with hook. Coarse vertical movements are secured by loosening the the clamp which encircles the standard, finer movements by turning the screw at its base. Motion fore and aft is secured by turning the screw at the end of the horizontal track.

Laterally the greater cornua of the hyoid stand out. The posterior surface of the laryngeal cavity is observed in its full extent, as well as part of the posterior tracheal wall. Only the anterior wall of the larynx remains concealed."

The apparatus, as first used upon the living, has undergone many changes at the hands of Killian, Albrecht and Bruenings. Doubtless many improvements will yet be made, but the principles involved in the first examination on the cadaver are the basis of the



instrument of to-day. Killian described suspension laryngoscopy for the first time at the International Laryngological Congress in Berlin in 1911. His first article on the subject was published in the *Archiv fuer Laryngologie* in 1912. An idea of the extensive use to which the instrument has been put since that time may be gained from a perusal of the literature, most of which is here cited.

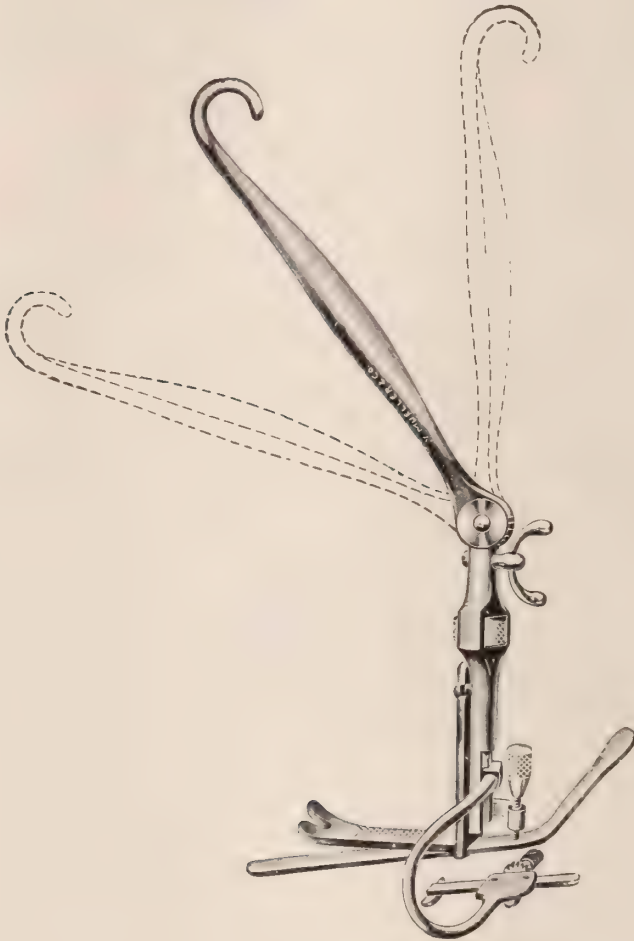


Fig. 2.—Enlarged view of hook in Fig. 1. Showing from above downward (1) thumb-screw by which the bend in the vertical arm is increased or decreased; (2) below it screw for opening or closing mouth gag; (3) upper end of gag with tongue depressor and epiglottis elevator with screw for fixing same; (4) lower end of gag with adjustable plate for engaging upper teeth. Latter can be locked by screw at the right.

*Advantages.*—For demonstrations to clinicians or bodies of students, the method is a great gain over previous procedures, demonstrations of one hour to one and a half hours being recorded, with no degree of discomfort to the patient. Minor operations can also be shown. An advantage mentioned by most writers is the opportunity afforded for the free use of both hands for manipula-

tions and operations. With the previous method, the left hand was continuously employed in holding the instrument, while the right hand alone was left free for operating.

For diagnosis and operations on children, the advantage is most marked. Before the days of the direct method the larynx of the child was practically a terra incognita, the larynx being first seen by the direct method by Kirstein in April, 1895. Killian advises the use of suspension in all cases, "when the cause of changes in the voice and breathing has to be determined." Among such conditions he mentions simple acute or chronic catarrh, a subglottic swelling or false membrane, a croupous or diphtheritic affection, node formations on the cords, papillomata, tubercle, syphilis, perichondritis, or a foreign body. It is of value in congenital defects of the larynx and in cases of difficult decanulment. In adults many writers call special attention to the method in the surgical treatment of tubercular laryngitis. Operative interference here by the indirect method as well as the direct has always offered many difficulties. In benign growths, one is frequently able to perform the entire operation at a single sitting, whereas previously many sittings were frequently required. In carcinoma, too, it offers a great help in that definite and specific areas may be more easily removed for microscopical examination.

In suitable cases where the use of radium or mesothorium is indicated, their use is greatly facilitated. The hypopharynx is rendered more accessible under suspension and can be easily inspected and explored in its entirety. The removal of foreign bodies from this situation is easily accomplished. Killian does not think, however, it is of any aid in esophagoscopy.

*Reported Cases.*—"Among children are the following. Albrecht reports 8 cases of papilloma in children from four to nine years of age in all of which these growths were successfully and completely removed, and 2 cases of tuberculosis of the larynx of which the first was a child thirteen years of age. There was dyspnea due to infiltration of the ventricular bands with edema and granulation of the vocal bands. Relief was obtained by the removal of the infiltration and granulations. The second was a child, nine years of age, with stridor from infiltrated ventricular bands with ulceration; relief was effected by removal of the infiltration. Three tonsillectomies were performed in children aged four, seven and eight years respectively.

"Henrich reports the case of a child three and a half years of age, with papillomata of both arytenoids, in the subglottic region, in the hypopharynx and in the esophageal entrance, successfully operated upon.

"Davis speaks of the examination of an infant four months of age suffering from laryngeal stridor. The cause was not determined. In a child three years of age, said to be suffering from laryngeal or tracheal obstruction, suspension was unsuccessful. Bronchoscopy succeeded but failed to reveal the cause of the dyspnea. Davis also removed a safety-pin from the larynx of a child eleven months old, and a coin from a child four years old that had lodged in the esophagus.

"Seifert reports the case of a child, three years of age, from whose esophagus a coin was delivered. A child, two years of age, suffering from papilloma, was saved from tracheotomy by direct curettement. In a child five years of age, he removed a bone from the

larynx. Seifert recommends this method for the removal of vocal nodules in children, for the excision of a portion of tumors for histological examinations, for the removal of subglottic granulations, and for the diagnosis of laryngeal diphtheria.

"Freudenthal reports 2 most interesting cases of postpharyngeal abscess of children, sixteen and nineteen months old, successfully operated upon. He also speaks of its uses in tonsillectomy, having performed this operation under suspension in twenty children.

"Iglauer reports the case of a child, three years old, successfully operated upon for papillomata of the larynx; also that of a child, five years of age, from whose larynx he removed a broken safety-pin that had been there five months. Three cases of enucleation of the tonsils were undertaken by him. He states that he could see no special advantage in this procedure over the ordinary method." (Quoted from Levy's article.)

Levy reports in all 6 cases. The first was a child twelve years old, with cicatricial tissue in the larynx necessitating tracheotomy. Under suspension a partially successful attempt was made to remove the cicatricial tissue and dilate the stenosed larynx. In the second case a stenosed esophagus was dilated and a plum seed subsequently expelled; in the third, dilatation of esophageal stricture was made following the swallowing of lye in a child of twenty-six months; in the fourth, there was removal of multiple papillomata in a child two and a half years old; in the fifth, removal of multiple papillomata in a child eight months old; in the sixth, removal of a wheat head from the larynx of a child ten years old.

The writer (Chamberlin) successfully removed from the esophagus (a case to be reported later) an open steel safety-pin, its point directed upward. Under suspension the tip of the head of the pin could barely be made out, well within the esophagus, by the use of one of the longer spatulæ. Here the free use of the two hands was a distinct advantage. The head of the pin was grasped and pushed far to one side by a forceps held in the left hand. With another forceps in the right hand the shaft of the pin was engaged between the head and eye and rotation easily accomplished. Subsequent removal was extremely easy. The entire operation required less than two minutes.

In adults the method has been frequently used in the treatment of laryngeal tuberculosis and for the excision of benign growths and portions of malignant growths for diagnosis.

Among the most interesting cases reported are those of Lynch. In this series the new growth was grasped with forceps and dissected free with a knife, just as it would be in any other situation in the body. In one case, where the resulting raw surface was unusually large, Lynch brought the edges together and sutured them with catgut. This he claims to be the first instance on record of stitching in the larynx through the mouth.

Tonsillectomy has been performed under suspension by many operators, notably by Killian, Albrecht, Skillern and Iglauer. The latter does not consider that it offers any advantages. In this view the author concurs. The maximum opening of the mouth with suspension is not as great as that secured by other suitable gags when suspension is not used. In addition, the pillars, both anterior and posterior, are under extreme tension. This renders the separation of the pillars from the tonsils somewhat more difficult.



Though the bleeding at the time of the operation, due to the tension on the pillars and constrictors of the pharynx, is certainly less, there is increased bleeding after this tension has been relieved. This might well lead to troublesome or even dangerous hemorrhage after the patient had been returned to the ward, occasionally even requiring re-anesthetization.

Although women and children as a rule stand suspension well, Killian calls attention to the fact that "all patients are not suitable for carrying out this procedure. Those who place difficulties in the way of introduction of tubes conduct themselves in a similar manner in suspension laryngoscopy. I refer to patients who do not open the mouth well, in whom the teeth in the upper jaw are very prominent, the tongue very thick and unyielding, and the larynx reached only with difficulty, by a narrow tube, from the angle of the mouth. In such circumstances it is hardly worth while to attempt the new method."

All writers agree as to the slight discomfort complained of by patients from suspension.

## THE MOST EFFICIENT DRUG FOR PROPHYLACTIC EYE TREATMENT OF THE NEWBORN.

### A REVIEW OF RECENT LITERATURE.

By HUGO EHRENFEST, M. D., of the Editorial Staff.

1. Credé-Hærder (*Zentralbl. fuer Gynækol.*, Vol. XXXVI, p. 1503, 1912).
2. Credé-Hærder (*Monatschr. fuer Geburtshilfe und Gynækol.*, Vol. XXXVIII, p. 310, 1913).
3. Credé-Hærder: Die Augenerkrankungen der Neugeborenen. Berlin. S. Karger. 1913.
4. Credé-Hærder (*Zentralbl. fuer Gynækol.*, Vol. XXXVIII, p. 116, 1914).
5. Harman (*British Med. Journ.*, May 24th, 1913).
6. Hellendall (*Zentralbl. fuer Gynækol.*, Vol. XXXV, p. 1453, 1911).
7. Herff (*Archiv fuer Gynækol.*, Vol. XCVIII, p. 178, 1912).
8. Lehle (*Muench. med. Wochenschr.*, Vol. LIX, p. 2161, 1912).
9. Schweitzer (*Archiv fuer Gynækol.*, Vol. XCVIII, p. 101, 1912).
10. Walker (*Journ. of Obstet. of British Empire*, Vol. XVII, p. 520, 1910).
11. Weidenbaum (*Petersburger med. Zeitschr.*, Vol. XXXVIII, p. 134, 1913).
12. Willim (*Klin. Monatsbl. fuer Augenheilk.*, October, 1911).
13. Zeman (*Gynækol. Rundschau*, Vol. V, p. 799, October, 1911).

It seems interesting to recall first of all the fact that Credé began to resort to an instillation of a 2 per cent. solution of silver nitrate as a prophylactic against ophthalmia neonatorum in 1879, the same year in which Neisser had discovered that practically in every case of a purulent ophthalmia of the newborn a characteristic diplococcus can be found in the discharged pus, which diplococcus also, almost without exception, is present in the vagina of the mother. Credé's claims and results were convincing enough to lead speedily to a very general adoption of the prophylactic method advocated by him.

In 1892 Cohn, of Breslau, ascertained that this dread disease had practically disappeared from all well-managed maternities of larger cities, while the number of cases in country towns hardly had diminished. The blame for this deplorable fact he placed altogether on the obstetricians, "who are striving to ascertain which one of the many equally effective prophylactics is the better, instead of spending the same amount of energy to proclaim widely the results so far obtained, or in attempts to make the prophylactic treatment

general, possibly by means of legislation" (Credé-Hørder). It was Cohn's motto: "Ophthalmia neonatorum can and must disappear throughout the civilized world," and this represents not a phantastic dream, but only a reasonable ultimatum; but how much nearer are we today, more than twenty years later, to the realization of this goal?

In 1912 we find Credé-Hørder once more taking up Cohn's work. He made personal inquiries, studied carefully the literature of the world, and carried on investigations and experiments. He presented the results of these exhaustive studies in a book entitled, "*Die Augeneiterung der Neugeborenen*" (S. Karger, Berlin, 1913). It seems disappointing to him that he found ophthalmoblenorrhoea, since the introduction of prophylaxis, a rarer but surely not an obsolete disease. Apparently the disease has disappeared in maternity hospitals but not in private practice, proving both the wonderful efficacy of the prophylactic method and the inexcusable negligence or indifference of the practitioner, especially of the midwife. He found among the 3,309 inmates of German asylums for the blind, 410 victims of ophthalmoblenorrhoea, i. e., 12.39 per cent. The expense of keeping one blind person for one year in one of these institutions averages 820 marks, or 340,000 marks per year for those blinded by an ophthalmia neonatorum. An enormous sum, which does not include the financial loss due to the unproductivity of these 410 individuals! One cannot fail to appreciate the justification of his bitter complaint that such a simple consideration should force thinking people to but one conclusion—namely, that it seems about time to stop all discussion as to the relative advantage of the one or the other drug, and to begin to use one of the many valuable solutions in the eyes of every newborn child.

And we feel that such a conclusion is forced upon us in spite of an occasional effort, usually coming from England, to show that all prophylactic efforts are superfluous, that legislation, making eye prophylaxis compulsory, deprives the individual of his right to personal liberty and never will be passed by law-makers of intelligence. We may read in Walker's paper some sentences like these: "Too long we have been obsessed by the fetish of Credé's method. . . . There is no germicide known to pathologists which is powerful enough to kill inevitably the gonococcus without grave peril to the human eye. . . . It is unreasonable to expect that one instillation of an antiseptic should be an absolute safeguard." Of course, such vigorous objection to compulsory prophylaxis, as made by Walker and more recently by Harman, can partly be explained and excused by the fact that in England the overwhelming majority of all confinements is managed by midwives, and not by physicians. By such legislation, therefore, manipulations, not void of danger if done very clumsily, would be forced upon a vast number of women ill prepared for such work.

Herff is not even satisfied with conditions in maternities, where obviously the later infection cannot be avoided by a single instillation, but where the earlier infection still occurs in about one to two of every thousand of the newborn. It is his conviction that attempts must be continued so as to eliminate ophthalmia absolutely from the maternities. What can be achieved, he shows by the records of the city of Basle (approximately 140,000 inhabitants), where in the last fifteen years only two infants became blind from an ophthalmoblenorrhoea. In the Austrian province of Salzburg



(180,000 inhabitants) where laws against ophthalmia have been strictly enforced since 1893, only one case of blindness was recorded in the last three and a half years. What Basle and Salzburg were able to accomplish with available drugs used prophylactically could, of course, be duplicated anywhere in the world, were similar laws passed and then enforced with the same strictness.

A paper of Zeman contains an imposing list of chemicals, from time to time enthusiastically advocated by the various authors: 2 per cent. argent. nitr. (Credé); 1 per cent. argent. nitr.; 2 per cent. argent. nitr. in form of a salve (Krukenberger); 2 per cent. argent. acet. (Zweifel); 1 to 2 per cent. carbol. acid (Olshausen); salicyl. acid (Bischoff); chlorine water (Schmidt-Rimpler); potass. permangan. (Valenta); zinc. sulfocarbolic. (Schröder); bichloride (Erdberg); 20 per cent. protargol (Fritsch); 1 per cent. formalin; pure lemon juice; syrgol (Hegner); airol (Herrenschwand); argyrol; collargol; itrol; argonin; argentamin; largin; sophol, and undoubtedly many more. At least in Germany Credé-Herder found the argentum nitricum solution most favored by the clinicians, argentum aceticum and sophol following in the order of their popularity as prophylactics. In this country it would seem that argyrol is favored mostly as the substitute for the silver nitrate.

Three requirements have always been exacted of a drug useful as a prophylactic: It must be able (1) to destroy the gonococci already in the conjunctival sacs but (2) without harming the eye and (3) without causing pain.

The multiplicity of drugs, actually or nearly complying with these three considerations, undoubtedly is responsible for the continuous rivalry of the authors to extol the particular advantage of their own favorite, and since this fact undeniably is the cause of lack of interest and zeal in the more important question of compelling by law all practitioners to use some prophylactic, one is forced to but one logical deduction—an effort must be made to reduce this long list of preparations by increasing the demands that can in all justness be exacted of a truly useful and acceptable drug. This step has been taken by Herff. In his opinion the prophylactic which can be expected to be used very generally must be a stable solution, which does not cause pain or irritation. The technique of its application must be so simple that it is irrelevant whether the fluid drops directly on the cornea or whether one drop or many reach the conjunctival sac. A secondary lavage must not be required because it renders the technique too complicated and inconvenient for general use. The drug must be so effective that its instillation is not required immediately after birth, but can be done some time later, since in private practice, for the sake of convenience, the eye treatment usually is not applied until the child is cleaned and dressed, a fact which undoubtedly counts for the occasional failure of the prophylactic method.

It may be stated right here that at present only one drug, the 5 per cent. solution of sophol, actually complies with all these requirements.

But it will be interesting to quote here from the literature the chief objections made by the various authors to certain shortcomings of drugs more or less in use. Obviously the question of the bactericidal power of the prophylactic is the most important. Investigations seem to prove that probably the standard drugs used

for this purpose, the anorganic and organic silver preparations, as a whole do not show very noteworthy differences if applied promptly after birth. For sophol only the advantage is claimed that it proves equally effective even if applied some time later. None of these drugs, if applied properly, is likely to cause a serious injury to the eye, though severe, even fatal, hemorrhages from the conjunctiva after silver nitrate have been recorded. Credé-Hœrder ascertained that no serious untoward result from routine eye prophylaxis has ever been seen in any German maternity. The question of pain does not seem very important in view of the necessity of but one application. Much more complicated, however, is the problem of the resulting irritation, the one problem which in the last analysis probably accounts for the refusal of a routine prophylactic instillation on the part of the general public, and even by those physicians who are thoroughly convinced of the advantage of such a routine. While in no way dangerous, argentum catarrhs prove most annoying to the practitioner and usually a source of worry to the parents of the affected child. It is the irritation problem which is responsible for the never-ending efforts to supplant the original silver nitrate.

The paper of Schweitzer contains exhaustive statistics showing the percentage of irritation following the use of the various drugs. It will suffice for this paper to state that he found the percentage of pronounced reaction strikingly low for sophol, and highest for silver nitrate without a subsequent lavage. Statistics collected by him as to the number of ophthalmia infections following the prophylactic treatment tend to prove that the percentage for argentum nitricum is larger than that of either argentum aceticum or sophol. At first an attempt was made to reduce the silver nitrate reaction by substituting a 1 per cent. solution for the original 2 per cent. solution. But further investigations showed convincingly that the irritation is less dependent on the concentration than on the age of the solution. The reaction question today seems narrowed down to the problem of finding a perfectly stable solution. In this respect silver nitrate is the least stable. Hellendal has positively ascertained that the discoloration and cloudiness, developing so early in silver nitrate solutions, is actually due to the liberation of free nitric acid, a product which has a very irritating effect on the tissues. He attempted to eliminate this factor by designing sealed glass ampoules in which the solution, prepared in a definite manner, is kept. Weidenbaum claims that an absolutely stable solution can be obtained which is non-irritating even after some time, if potassium nitrate is added in the same quantity as silver nitrate. Other authors claim to have reduced or completely avoided reaction, if the instillation is followed by a lavage of the conjunctival sac with a boric acid or saline solution immediately or after a definite time (three hours; according to others, six and even ten hours). It cannot be denied that such further manipulations, especially several hours after birth, will prove not only inconvenient and annoying in actual practice, but in many instances will be neglected. Herff's demand for simplicity of technique must be accepted if the prophylactic eye treatment shall ever become the general routine.

Obviously the thought suggested itself that the degree of reaction after instillation may stand in direct proportion to the escharotic effect of the prophylactic. Therefore, several authors studied



the necrotizing effect on certain tissues produced by the various solutions. A most exhaustive study of this problem has been undertaken by Schweitzer. He investigated 1 per cent. argent. nitric.; 1 per cent. argent. acetic.; 2 per cent. argentamin; 2 per cent. argonin; 10 per cent. protargol; 1 per cent. collargol; 5 per cent. sophol; and both 10 per cent. and 20 per cent. argyrol. In general he found the anorganic silver preparations producing more pronounced tissue alterations in form of necrosis than the organic silver preparations. Among the latter, sophol and argyrol do not cause any noticeable destruction, while, on the other hand, silver nitrate produces the most marked escharotic effect. The deduction would seem justified that the drug, which destroys tissue most extensively, of course, without causing any permanent changes, is the one which will be most valuable, since it is more likely to destroy the bacteria also, and even in a deeper layer. The correctness of such a deduction, however, seems greatly weakened by the counter argument that the bacteria at the time of a prophylactic instillation immediately after birth lie superficially, and that the resulting cell destruction, with its subsequent defects in the epithelial covering of conjunctiva or cornea, may actually favor the deeper infection, or possibly be partly responsible for the late infection. Such histological investigations have also been made by Credé-Hörder; and his microscopic studies are possibly more valuable, since they are not limited to animal tissues but include the eyes of the newborn who had died soon after the prophylactic treatment. He limited his examinations to the escharotic effects of only four solutions: 1 and 2 per cent. argent. nitric.; 1 to 3 per cent. argent. acetic.; and 1 per cent. sophol. The histological changes were always only temporary and were always limited to the palpebral conjunctiva, the cornea being always found intact. There were no differences discernible if anywhere from two to five drops were instilled. The immediate effect of the 2 per cent. silver nitrate solution was most pronounced; it was decidedly less marked either with argentum aceticum or sophol; but Credé-Hörder also feels loath to express an opinion as to whether this actually represents an advantage or disadvantage of the latter solutions as prophylactics.

Thus it can be seen that the actual value or absolute advantage of a certain preparation cannot be determined by chemical or histological studies, but solely by statistics and through the personal observations made by experts on a large material.

This paper, therefore, may be concluded with an enumeration of the prophylactics which, within the last few years, have been proclaimed as the most efficient in the experience of various writers.

The overwhelming majority of all textbooks on obstetrics, whether foreign or American, recommend the 1 or 2 per cent. solution of silver nitrate, with or without a subsequent lavage to avoid too intense reaction. It seems fair to assume that today these preparations are the most generally used. Hellendal feels that this silver nitrate solution in the hermetically sealed glass ampoules (a similar preparation is now on the American market) solves the problem of prophylaxis. He acknowledges, however, that these ampoules have not proved satisfactory in the hands of such an expert as Herff and that the Prussian health authorities do not consider them advantageous enough to recommend their general use. Mention has been made of Weidenbaum's claim to render the



silver nitrate solutions stable and non-irritating by the addition of potassium nitrate. We find Schweitzer in favor of the silver acetate solution followed by a careful washing of the conjunctival sacs with a saline solution—a procedure not acceptable for the believer in the necessary simplicity of a prophylactic method.

The organic silver preparations at first seemed to have the advantage over the anorganic preparations by being, in general, more stable and less irritating. They have, however, as a whole, been found wanting in their bactericidal power. Many of these proprietary preparations have enjoyed but ephemeral popularity, and only two of them have really been used to such an extent that definite opinion could be formed concerning their value—namely, argyrol and sophol. The first named drug is today extensively employed in this country in a 20 or 25 per cent. solution. It is proving irritating in a considerable percentage of cases, a disadvantage which, in the customary way, has been overcome by the use only of very fresh solutions (not more than one week old) or by the subsequent flushing of the eyes with boric acid or saline solution. No extensive statistics concerning argyrol can be found in the literature of the last few years. Considerable attention, especially in German literature, has been given to the study of sophol. This is an organic silver salt containing 22 per cent. of silver in combination with formaldehyd-nuclein-acid. It has been introduced as a prophylactic against ophthalmia neonatorum by Herff. Most favorable reports are available from Lehle, who feels that it must be given preference over all other known prophylactics. Willim claims that a 1 per cent. solution of silver nitrate proves about as efficient as a 2 per cent. solution, but that sophol comes nearer to the ideal of useful prophylaxis. Zeman, in a very careful study of the problem of eye prophylaxis, arrives at the conclusion that a 5 per cent. solution of sophol will be found approximately equal to a 20 per cent. solution of protargol. He quotes the good results of Valenta and others. But for thorough information on this question one has to turn to Herff's various papers, especially his very scholarly study in the *Archiv fuer Gynækologie*. He reviews critically the entire literature and answers the various objections that have been made especially against sophol. This drug is employed in a 5 per cent. solution prepared by placing the powder into cold water. No heat must be used to hasten the solving. No addition must be made of any other chemical for any purpose; therefore, the physician will do best to make the solution himself and not to order it in a drug store. Such a solution does not become weaker by age and will prove stable for at least four weeks (according to others, up to two months) if not subjected to heat, intentionally or unintentionally. In one instance of disagreeable irritations following the sophol it was ascertained that the nurse had kept the bottle standing on a hot radiator. Heat will liberate a certain amount of formaldehyde which will cause reactions. The chemically pure solutions becomes irritating only in a concentration of 9 per cent., and therefore there is no danger of increased concentration due to evaporation if the 5 per cent. solution is employed. As to results, he seems entitled to an opinion, since he has used sophol in the eyes of 10,000 newborn infants, and had in this number not one case of argentum catarrh and but one single case of gonorrheal ophthalmia.

It has already been stated that Herff is convinced that a general

routine of prophylactic eye treatment, probably enforced by stringent laws, will be dependent upon the discovery of a drug which will prevent ophthalmia without doing harm even to the extent of an irritation, the application of which will be simple, devoid of any complicated or necessarily skilful technique, a drug which will demand a single application that can be made by anybody. There may be doubt in the minds of some that Herff is justified in making so many demands; but all those who acknowledge the social-economic advantage of enforced general eye prophylaxis for the newborn must agree with Herff that the 5 per cent. solution of sophol today represents the most acceptable if not ideal prophylactic. The solution is made by the physician himself and keeps at least four weeks. The technique of its application is simply to bathe both eyes with the solution after the infant is cleaned and dressed.

## DIAGNOSTIC AND THERAPEUTIC NOTES.

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PHENOSULPHONEPHTHALEIN RENAL FUNCTION TEST.—Fanz (*New York Med. Journ.*, Dec. 19th, 1914). Fanz has simplified the test by using ordinary cylindrical 1,000 c.cm. graduates in place of the somewhat expensive colorimeters. The difference in tint between the specimen and the standard solution, due to the urinary salts, is obviated by making up the standard solution with the patient's own urine. To make up the standard solution, use 1 c.cm. of the contents of an ampoule of the phthalein, add the patient's urine (obtained before injecting the indicator) in amount to equal the first hour's urinary output after appearance of the drug. Alkalinize this mixture with 25 c.cm. of 10 per cent. potassium hydroxide, filter, and add sufficient distilled water to make up 1,000 c.cm. This is the standard and contains 100 per cent. of the indicator in 1,000 c.cm.

The first hour's urinary output after injection of the 1 c.cm. phthalein is now alkalinized with 25 c.cm. of the 10 per cent. potassium hydroxide, and filtered. To this is added enough distilled water to make 1,000 c.cm. This is the test specimen and is much lighter in color than the standard. By diluting a unit of the standard, say 50 to 100 or 200 c.cm. with distilled water until it matches the 1,000 c.cm. solution of the first hour's urinary output, the direct percentage of the indicator in the first hour's specimen can easily be estimated. Say, 100 c.cm. of the standard had to be diluted up to 500 c.cm. before it matched the first hour's specimen dilution, then the standard would be five times as strong as the specimen, or the specimen would contain 20 per cent. of phthalein. The second hour's output of indicator (phthalein) is estimated precisely like the first.

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AN AID IN THE EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS.—Beifeld (*Arch. of Diagn.*, October, 1914). Fine râles constantly present over one apex are among the most useful signs of early tuberculosis. To promote the production of these râles, various means have been advocated; a deep inspiration, sharp coughing, a deep inspiration after the patient has counted aloud as long as possible in a single breath, the exhibition of potassium iodide, etc.

As another aid in the eliciting of these râles, the writer (and others to whom he has communicated the finding) has had success with what may be termed the whispered-voice method. It consists in having the patient whisper in an emphatic way, repeating "one, two, three" a number of times, following which he is instructed to inspire deeply. It is a frequent observation that when the other above mentioned methods fail, this procedure is successful in bringing out the significant apical râles.



**BLOOD-PRESSURE IN ARTERIOSCLEROSIS.**—Janowski (*Zeitschr. fuer klin. Med.*, Vol. 80, Nos. 5 and 6). In the absence of nephritis, the great majority of arteriosclerotics show a normal blood-pressure. This is probably due to a progressive weakening of the cardiac muscles which keeps pace with the increasing rigidity of the arteries. The latter would tend to raise the pressure, but this is counterbalanced by the enfeebled pumping action of the heart. In the presence of a nephritis, however, a high blood-pressure is the rule. This may be a conservative effort on the part of the organism to prevent the occurrence of uremia. The importance of routine blood-pressure determinations in arteriosclerosis is obvious.

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**TEST FOR OCCULT BLOOD IN THE STOOL.**—Wagner (*Arch. fuer Verdauungskrankh.*, Vol. 20, No. 5). A little of the stool (if formed, from its central portion) is spread over a clean slide. Over this the reagent is poured. The latter consists of a bit of benzidin, dissolved in 2 c.cm. glacial acetic acid, to which 20 drops of 3 per cent. hydrogen peroxide is then added. A blue color shows the presence of blood. The test is as delicate and as reliable as any of the other benzidin tests and has the advantage of cleanliness, since it involves a minimal handling of the stool. If one wishes to exclude extraneous ferments, which theoretically constitute a possible source of error, the slide carrying the film of dried stool may be passed through the flame, as in ordinary bacteriological work.

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**CARAMEL IN DIABETES.**—Grafe (*Muench. med. Wochenschr.*, 1914). Caramel, in large doses, does not increase the glycosuria of diabetes, but does lessen the acidosis. It is readily assimilated and can be safely given to the severest cases of diabetes. Being a carbohydrate of high caloric value, its usefulness in this disease should be great. To prepare it, grape-sugar is heated dry in an aluminum pan to a temperature of 140-150° C. (285-300° F.), or it may be obtained ready-made from Merck. It is given in doses of 100-200 grm. daily, either in combination with an oatmeal regimen or together with vegetables, fat and proteid.

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**DETECTION OF BILE AND BLOOD PIGMENTS IN THE URINE.**—Lipp (*Muench. med. Wochenschr.*, No. 38, 1914). A layer of fine, white sand, several mm. in thickness, is spread upon a plate and a little of the urine poured into it. If the urine contains pigment, the sand will be stained in a characteristic manner, a brown stain indicating the presence of hemoglobin, a greenish stain that of bile pigment. The test is said to be trustworthy as well as convenient.

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**STERILE VACCINE.**—Geissler (*Veröff. aus dem Geb. der Medizinalverwaltung*, Berlin, Vol. 3, No. 11). After many failures, the writer has at last succeeded in producing a sterile cow-pox lymph. He rubs 5 c.cm. of lymph through a fine bronze sieve and adds an equal amount of 2 per cent. hydrogen peroxide, acidified with carbonic acid. After forty-five minutes, the peroxide is decomposed

by the addition of a sterile extract of yeast and the mixture warmed to expel the carbonic acid gas. The vaccine so treated is sterile bacteriologically but still active.

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COMPLICATIONS OF VACCINATION.—Gœppert (*Therap. Monatsschr.*, November, 1914.) Two categories of children should be excluded from vaccination. The first includes those suffering from some grave ailment and with a much impaired nutrition. The second group includes children with eczema or who have had a generalized eczema within the past six months. This rule applies, of course, only if there is no epidemic of smallpox and if the children have not been exposed to a possible contagion.

## BOOK REVIEWS.

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TEN SEX TALKS TO GIRLS (14 Years and Older). By Irving David Steinhardt, M. D., Instructor in Clinical Surgery and Assistant Surgeon, Cornell University Medical School, etc. etc. With Six Illustrations. Philadelphia: J. B. Lippincott Company. 1914. Price, \$1.00.

TEN SEX TALKS TO BOYS (10 Years and Older). By Irving David Steinhardt, M. D. With Twelve Illustrations. Philadelphia: J. B. Lippincott Company. 1914. Price, \$1.00.

It cannot be denied that young boys and girls can derive definite benefit from a proper understanding of the physiological function of their genital apparatus, but most emphatically it must be denied that this benefit ever can be expected from a perusal of either one of these two little volumes. Would the author, it may be asked here, have enough temerity to present his daughter, say, on her fourteenth birthday, with the volume on "Sex Talks to Girls" so that she could study the external genitalia as shown in Fig. 6 or turn to p. 149 and learn the symptoms of incipient pregnancy? And would it be within the bounds of reason to imagine that he would quiz his own son of immature years, who had been unfortunate enough to have read the book on "Sex Talks to Boys" as to the proper answer to the query which appears on p. 33, and which runs as follows: "Locate the urethra and describe briefly its three portions?" And how about the question on p. 151: "How can you promote modesty in woman's dress"?

These books are not without value, but their importance as a contribution to sex literature is greatly lessened by questions such as have already been cited, and others of the same calibre. Of course, parents may profit by a close perusal of the books, but even though they may be above the ordinary intelligence, will they have the judgment to separate the grain from the chaff? We hardly think so.

TRACHOMA AND ITS COMPLICATIONS IN EGYPT. By A. F. MacCallan, M. D. Cambridge, F. R. C. S. England, Director of Ophthalmic Hospitals, Egypt. New York: G. P. Putnam's Sons. 1913. Price, \$2.50.

A complete description of all of the methods of treating trachoma and all the various operative procedures has not been attempted in this little book. A simple description of trachoma, as it is met with in the East, and of its treatment, as carried out at the Egyptian ophthalmic hospitals, has alone been attempted. Dr. MacCallan, who for a number of years has been director of the ophthalmic hospitals in Egypt, describes the organization of the fixed and traveling ophthalmic hospitals which were first established in 1904. There are at present eight fixed hospitals, and there will soon be added six more. Besides these permanent hospitals, one for each town of the fourteen provinces and accommodating from fourteen to thirty in-patients, there are the traveling hospitals consisting of a number of tents, which are set up for varying periods, usually from four to six months, in districts remote from cities.

The service rendered by physicians in connection with these traveling hospitals has proved a great boon to trachoma-ridden Egypt. Some idea of their need may be gleaned from the attendance in 1912, which was 341,211 (28,029 patients); 21,315 operations were performed.

OPHTHALMIC SURGERY. A Treatise on Surgical Operations Pertaining to the Eye and Its Appendages, with Chapters on Para-Operative Technic and Management of Instruments. By Charles H. Beard, M. D., F. A. C. S., etc. etc. Second Edition, Revised and Enlarged. With 9 Plates, Showing 100 Instruments and 374 Other Illustrations. Philadelphia: P. Blakiston's Son and Co. 1914. Price, \$5.00.

The present second edition of Beard's excellent manual on the surgery of the eye contains 33 pp. additional text and 80 more illustrations than the first edition. The book, however, does not appear to be materially enlarged, owing to a careful condensation of the contents. Two new chapters have been added: one on the newer operations for glaucoma, the other on the surgical treatment of detachment of the retina. No progressive ophthalmologist should fail to secure this most excellent treatise.



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## EDITORIAL.

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### GENERAL IDEAS AND THE MEDICAL PROFESSION.

Perhaps it has never been remarked, even by the closest reader of medical articles, how often general ideas are paramount to special ideas, or perhaps it has been remarked and been noted with enjoyment because of the ease to grasp general ideas and the difficulty to grasp special ideas. A special idea, even when succinctly and clearly presented, is often so disturbing an element in a medical composition, so opposite to some preconception on the part of the reader, so audacious and so new, that it fares ill, and instead of commanding the attention it deserves is pushed aside for the general ideas which follow, or, if these are lacking, for the thoughts, old though they be, which the majority of readers have with them always and which they are only too willing to inject into an article to make it pleasant reading. Who has not marveled at the criticisms which flood the medical press directly special ideas oppose their strength against general ideas, criticisms which emanate from no other source than an inborn hatred of what is specific. When salvarsan was first described to the medical world even the most intelligent doctors shook their heads in sorrow and loud were the lamentations throughout the world that an old and tried treatment for an ancient disease should be riddled by a new and specific idea. What foolhardy acts did not that vast army of general ideas perpetrate on the medical public! Indignant doctors, who had never written for the medical press before, found at once an outlet for their outraged feelings in articles that were full to choking with general ideas; and though the writers invariably started their disquisitions by asserting that they were not prejudiced against the

new treatment, that for calmness and judgment they were quite unequaled, any reader of even ordinary intelligence could see that here was a splendid illustration of the fear that the ramshackle structure containing general ideas was in danger of going the way of all old lumber on account of a discovery that would pull from under it its strongest prop. If we cite the case of salvarsan it is merely done because it best illustrates among recent medical controversies how difficult it is to put general ideas to flight even though the weapon in hand is a death-dealing one.

That we are not alone in our rather belligerent attitude toward general ideas has been brought home to us forcibly by an essay in the "Point of View" section of *Scribner's Magazine* for March, in which the writer makes the positive statement that as a result of the war which is going on so insanely in Europe at the present time there will be one sane outcome—"the slaughter of that vigorous veteran, General Ideas." Then he proceeds to show us that our general ideas in regard to national characteristics have been all wrong and that it was our glibness of speech that made us say so many silly things about the English, the French, the Russians and the Germans, a glibness that got its sustenance continually from hearsay and those alluring prejudices with which even the most intelligent people sprinkle their conversation when expatiating on national traits other than their own.

Are physicians exempt from these faults? are they not as guilty as are others of having been slaves to that "entertaining old humbug, General Ideas"? They may protest that their love of science makes them broadminded; they may asseverate that having traveled intelligently they had unusual opportunities to study national traits; they may say all this with conviction, but the fact is they have been as closely and as tightly enmeshed in the hundred and one tentacles of general ideas as has the non-medical man. How is it possible for them to be otherwise when their writings on medical subjects, with few exceptions, show their abhorrence of special ideas, when in their conversation on medical subjects there are always generalizations so that no one will be offended? Have they a special idea of any foreign medical literature other than German? Mention French, English, Italian or Russian medical literature to them, and what is the result? A remark founded on prejudice and hearsay, an asininity of speech that is tolerated to-day because "General Ideas" is not yet dead, but fortunately will not meet with much favor if what the essayist in *Scribner's Magazine* asserts will come to pass after the present cataclysm.

Yes, indeed, it would be well for the medical profession if a change would take place. Let us open the portals of our minds to all literatures, no matter what their nationality; let us learn enough of a foreign language to read a nation's medical output with intelligence. How many amongst us know even enough French to follow the literature of that nation, or enough Italian to discuss the progress of medicine in Italy to-day. Perhaps it would be asking too much to insist on a reading knowledge of Russian, but without it, will we ever be in a position to know of Russia's medical advances? A few years ago we were quite ignorant of the art of Russian dancing, of the extraordinary qualities of Russian music. Of course, we had read or heard of Turgenieff, Tolstoy and Gorky, but our knowledge went no farther, and to-day how many of us know of Dostoevsky, Anton Tchekov, Leskov, Michael Artsibashev and Leonid Andreyev? And is Pavlov the Alpha and Omega of modern Russian medicine?

P. S.

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#### THE GENTLE ART OF THE MEDICAL CRITIC.

No doubt not once but often you have thought of certain celebrated men and women in a moral sense, that is you have fully made up your mind as to their status in that very unnatural world in which are set up your own precious standards of morality and immorality. You may have read only the defamatory books about Mary Stuart and concluded without further enlightenment that you had in hand a subject that had no morals whatever, or you may have read the wrong books about Henry VIII or Napoleon, or even about Caligula and Nero and Sardanapalus and have thought them too impure for even slight mention in your unnatural world. All these things are possible and could happen to anyone of deep perspicacity and considerable wisdom; but what is worse in your unnatural world than all this thoughtless condemnation is the fact that for years you have placed on the highest pedestals both men and women who have absolutely no right to be there. At least this is what modern criticism teaches us daily, the so-called higher criticism which plays ducks and drakes with one's character and chuckles when a victim is found. Medical men being weakly human, what more natural than that they should fall in line;—and behold as the fruit their first endeavors the complete subversion of all our cherished thoughts in connection with the characters of Charlotte Brontë and Mme. Récamier!

Let us take the case of Charlotte Brontë first. A retiring, demure, provincial English woman of the first half of the nineteenth



century, a genius, compelled to lead a lonesome life at Haworth Parsonage and at the Pension Héger in Brussels, where she was English governess and "one wearies from day to day of caring nothing, fearing nothing, liking nothing, being nothing, doing nothing—yes, I teach and sometimes get red in the face with impatience at their stupidity. But I don't think I ever scold or fly into a passion." Constantin Héger and his wife were at the head of this school, the Paul Emanuel and Madame Beck of the author's novel "Villette," the former sympathetic, the latter just the opposite. Charlotte Brontë was attracted to M. Héger for the reason that he was about the first intellectual man she had ever met, the sort of man who had a wide horizon and considerable knowledge of books. Her life as English governess when in this school, though humdrum enough, had some of its burdens lifted by an association that was purely intellectual, and she deeply regretted her departure. Even if the portrait of Madame Beck, as it appears in "Villette," is an exaggeration of Madame Héger, one can readily see that Charlotte Brontë had nothing in common with "a clever, scheming schoolmistress watching all the threads of her large establishment with a Napoleonic energy." A commonplace story this, but what do we learn to-day in the light of modern criticism? Recently, Dr. Paul Héger, an honored physician of Brussels and son of Constantin Héger, turned over to the British Museum four letters which Charlotte Brontë wrote to his father and which remained unanswered, because "he [Dr. Héger] wished to put an end to all gossip and speculation about the relations between his father and the English novelist." No one who reads these letters can doubt for a moment what a huge mistake was made when they were published in the *Times*. The floodgates of criticism were opened; a sympathetic critic, Clement Shorter, excused the epistles on the ground that the authoress may have been in a neurotic state at times, but warned the public against "an act of treachery to a great writer's memory to attempt to pry too closely into her heart." But out of the blunderings of the Brussels doctor there has come only the blighting of a reputation that we had thought impeccable, and even though we may be as sympathetic as Mr. Shorter and others, we are nevertheless constrained to lower the pedestal which we had heretofore erected in our unnatural world of moral estimates.

As easier task presents itself when we take up the complete destruction of the hitherto pure and innocent career of Mme. Récamier at the hands of Dr. Potiquet in his recently published brochure, "Le Secret de Mme. Récamier." Being Anglo-Saxons

completely fortified with time-honored prejudices, it is as simple as playing marbles for us to say that a Frenchman or French woman is immoral, and that to imply virtue to either is in direct opposition to common sense. Of course, there are reasons for this, since no matter how much we crave virtue in our own literature, in the literature of France some grave immorality must be presented, otherwise the biography is declared by us hopelessly uninteresting, in fact a gross insult to our intelligence. No doubt, there are just as many moral persons in France as elsewhere, but our puritanic strain would ere this have died of dry rot if it had not been fed continually by naughty anecdotes from French sources. But in the case of Mme. Récamier we thought that at last we had come across a French woman who could hold her head as high as the purest in the exalted circles of Anglo-Saxon morality. In fact, being a French woman she lost considerable interest on account of her exasperating respectability; but all this has been cast to the winds and we have before us now, thanks to Dr. Potiquet's booklet, the portrait of the celebrated woman as we are wont to paint all those of Gallic blood—the mistress of Chateaubriand, won not through fascinations, but on account of his great prowess in overcoming a physical disability! Another idol smashed by modern criticism which halts at nothing, and again by the ruthless hands of a physician!

It has often been said that if we want to know the truth about our neighbors, the person to whom to apply is the physician in the neighborhood. This may be an exaggeration; but granting that it is, it happens often enough that doctors talk too much. Numerous suits which have been aired in the courts of late attest to this propensity, but even the heavy damages in which they have been mulcted do not appear to have had a staying effect. But as regards the dead they need have no such fear; and since the so-called higher criticism must not spurn any matter, be it ever so despicable, in its elucidation of what is obscure and mysterious, why should medical men withhold their beneficent help in the matter of a better understanding of certain strange and abnormal acts. Truly, a great field of labor lies before them: the re-writing of many biographies; but let us hope that they will do their work slowly, for otherwise what an empty place will be our cherished Valhalla of respectable men and women.

P. S.

## MEDICAL CULTURE.

It is with considerable hesitation that we write the word 'culture;' but though this word has appeared so often recently in print and in conversation it is not our intention to start a controversy as to the defects of Anglo-Saxon culture and the supernal qualities of *Kultur* as understood only by the Germans. What we mean to do is to limit ourselves to medical culture as it can be acquired in these United States and to dwell on its advantages to the medical man after he has achieved its mastery. We are incited to this task by the recent writings\* of Dr. T. D. Crothers, and we feel that an important chapter in the life of the physician has been a closed one altogether too long on account, we take it, of the exigencies of his medical studies when at school and his strenuous life when in the maelstrom of practice. No doubt, when the medical student embarks on his career, he imagines that his knowledge of medicine, abetted by the perfume he uses on his pocket-handkerchief and the fantastic design of his waistcoat and incongruous color of his neckwear, will carry him safely through the shoals of adverse criticism; but let him not be too cocksure of his invulnerability, for criticism like the poor is always with us, and even his deep knowledge of all the cocci will not protect him at times from its mordant, devastating shafts. Fortunately, the youthful aspirant of medical honors is not sensitive as regards derogatory remarks in connection with his dress; he is not downcast with the sad result that his whole career is forever shipwrecked; but though he may be a hardened sinner in respect of the niceties of hat, coat and trousers and the rest of man's paraphernalia, he should not refuse to hearken to advice, especially when it is so gently given as in the case of Dr. Crothers' articles.

We glean from a close scrutiny of the two papers that the medical student, to acquire a knowledge of how he should conduct himself later in life, how he should dress, how he should modulate his voice to make it pleasing, how he should acquire all those graces of speech and manner which will count greatly for his success as a medical man, must have, during his student days, the proper environment, not so much at home but in the lecture rooms, in the laboratory, and especially in his daily intercourse with the professors. That the young are imitative is an observation that has been delivered to a weary world perennially by those who have elected themselves as

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\*Voice and Manners in Medical Practice (*Medical Record*, May 16th, 1914);

A Neglected Field of Medical Culture (*Medical Record*, February 27th, 1915).



acute and penetrating philosophers; and believing firmly in the truth of this saying, we fully agree with Dr. Crothers that a sensitive student, who is enraptured with the wisdom of his favorite professor, will also imitate his style of dress and his manner of speaking. Without impugning the medical profession as a whole, we must admit that when it is a question of clothes or neckwear, medical men, even of the exalted type of professors, are not adepts; and though occasionally one sees a well-dressed man, the prevailing impression to be gathered by an unprejudiced observer is shiny suits and ties that are either black or white, known as 'string' ties in haberdashery circles, or of a color that screams to the ceiling of the lecture room if not to the high heavens. A 'string' tie is not such an objectionable decoration, provided it is black and worn with a turned down collar; but when it is placed carelessly or even carefully around a standing collar, its innate stubbornness prevents it from being content to remain in its original position; and greatly to our sorrow have we seen not once but often the spectacle of a learned medical man holding forth on some abstruse subject with his black 'string' tie in complete disarray. Now we fully agree with Dr. Crothers that all these dress solecisms are not the proper things for the keen eyes of the medical student to observe, but how, may we ask him, is he going to change the ingrained custom of what, alas! to-day constitutes the complete and harmonious union between science and dress?

As regards the matter of voice, we again agree with Dr. Crothers. It is a fact that has been glaring us in the face for many years that we Americans are about the most careless people in the world in regard to voice culture and that no nation can give forth so many cacophonous sounds, the gamut ranging from the raucous to the nasal. It is also a fact that lawyers are beginning to pay some attention to this national defect, fully aware that a jury must be moved to tears or laughter, otherwise their legal lore will be a failure. But even though we, as medical men, are willing to admit this, should the soft modulations or the stern tones of the modern Lysurgus be a model for the physician? We hardly think so; and yet we must admit that as lecturers our medical men fall far short of what they ought to be as agreeable and pleasant speakers, and are so anxious to tell us all the technical terms that are surging in their teeming brains that small regard is paid to the voice envelope which is used. Indeed, the times are ripe or rather over-ripe for a decided improvement; and the sooner our lecturers learn the lesson of the advantages to their discourse in speaking their words softly and

agreeably and the beneficent results on their hearers, the more gratifying will be the outcome as illustrated in the voice production of the coming medical men. A drastic criticism, undoubtedly, are the two papers by Dr. Crothers; and the only gleam of hope that we can discern in them is the following, which goes to show that though we are great sinners as trainers of the voice, yet occasionally similar defects are acquired by the American student abroad, plus bad manners: "A young man who spent five years in the great medical centres of Europe came back with coarse mannerisms and harsh, abrupt tones. He had imbibed the very worst manners and coarseness of expression of his teachers. This was his downfall. He was disappointed at his failure to win and became an inebriate."

May we be pardoned for asking the pertinent question, now that it is the invariable custom for American medical students, when abroad, to study only in German medical schools, whether all these dire results could be traced to German *Kultur*? P. S.

## ORIGINAL ARTICLES.

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### ON DIAGNOSIS AND PROGNOSIS IN GASTRIC ULCER. A CLINICAL STUDY OF 500 CONSECUTIVE, OPERATIVELY DEMONSTRATED CASES.\*

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#### PRELIMINARY REPORT.

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It is with deep gratitude that I wish to express my appreciation of the honor which your Society confers by permitting me to address you on this occasion. I trust that the facts which I have to present upon the subject of gastric ulcer will prove not altogether valueless.

The material comprising this report was obtained from my records at the Mayo Clinic and at Augustana Hospital. Five hundred operatively demonstrated gastric ulcers make up the series. Instances of *ulcus carcinomatosum* are not included in the study. They have already been analyzed in a recent paper.

Certain *etiological factors* are of service toward the diagnosis of peptic ulcer. They will be emphasized briefly.

*Relative Frequency.*—Until modern surgery returned definite information respecting the location of peptic ulcers, it was commonly held that gastric ulcer was of more frequent occurrence than was duodenal. Our observations show that in 1,725 instances of proved peptic ulcer, there were 1,225 cases of duodenal and 500 of gastric ulcer, or a proportion of 2.45 to 1.

*Age.*—The greatest number of cases occurred between the ages of forty and fifty years. More than three-fourths of the cases were in the interval between thirty and sixty years.

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\*Address in Medicine, Seventieth Meeting of the Northwestern Ohio District Medical Association, Tiffin, Ohio, October 21st-22nd, 1914.



*Sex.*—In my series there were 315 males and 185 females, or approximately 2 males to each female. In males the greatest number of ulcers occurred at a decade older than in females.

*Nationality.*—American-born furnished 68 per cent. of cases. The remainder were of European or Canadian extraction.

*Occupation.*—More than 31 per cent. of our cases were farmers. Practically every other occupation was represented.

*Habits.*—In 145 cases a history of the use of alcohol was obtained. In 26 instances spirits had been used in excess. Smoking or the use of tobacco in any form appeared to be but an accidental factor in ulcer production.

*Dietetic Errors.*—The frequent occurrence of the disease in American-born farmers (31.4 per cent.) is worthy of notice. We can find no single dietetic factor of particular significance.

*Previous Infectious Diseases.*—Seventeen per cent. of our patients gave a history of having had typhoid fever. Numerous instances of pneumonia, scarlet fever, measles, severe grippe, tonsillitis, malaria and rheumatism were noted. Twelve patients had had syphilis (2.4 per cent.). It was frequently observed that after an acute infectious disease, the ulcer symptoms appeared, or those ulcers already existing were aggravated at such time.

*Association of Gastric Ulcer With Other Abdominal Pathology.*—Of the entire series, in 180 patients (36 per cent.) who had had previous appendectomy or laparotomy for ulcer, the appendix was found to be diseased. In 70 instances (14 per cent.) cholecystitis or cholelithiasis was found at operation or their previous occurrence had been noted. In other words, of 500 cases of gastric ulcer, affections of the appendix or gall-bladder, generally of inflammatory type, were proved to co-exist at some phase in 250 or 50 per cent. of the series. This observation is of sufficient importance to warrant emphasis from at least three points: (a) The etiological significance of local foci of disease in the appendix and the gall-tract in relation to coincident or subsequent changes in the stomach wall; (b) the prognostic limitations respecting proper stomach functioning following appendectomy, cholecystectomy or cholecystostomy, and (c) the advisability of careful anamnesis and abdominal examination of individuals whose only ailment, symptomatically, appears to be located in one of the above regions.

In addition to gall-bladder and appendix affections, Lane's kink was found five times, pancreatitis thirteen times (2.6 per cent.), retroperitoneal sarcoma, carcinoma of the gall-tract, and ureteral stone each once.

*Clinical Symptomatology of Gastric Ulcer.*—The most striking clinical feature of the disease is comprised in what the term 'periodicity' includes. By this we mean that discomfort occurs intermittently, in 'spells' or 'attacks.' Between such periods there

is (until gastric stagnation comes on) good gastric health. Of our cases, 360 (69.2 per cent.) fell into this class. These spells of distress frequently bore definite seasonal relation—spring and fall being favorites. This is not altogether a valueless observation, if we are to consider bacterial infection as an important etiological factor in the production of gastric ulcer. It will be recalled that at these seasons epidemic infectious ailments are common. At such time actual infection of a gastric mucosa may take place or a reinfection may occur in a healed ulcer surface or one in process of repair.

In a given case the periodic recurrence of ulcer dyspepsia often happens wholly without regard to medicinal, dietetic or other form of treatment. In this connection, it may be useful to call attention to the fact that various clinicians who have advanced dietetic cures for gastric ulcer (Williams and Donken, Ewald, Weinstein, Boas, Lenhartz, von Leube and a host of others) claim that such 'cure' occurs in from 62 per cent. to 70 per cent. of instances, and those figures, it will be recalled, are returned from widely different and frequently opposite modes of therapy. The close approximation of these figures to that of periodicity of manifestation of ulcer shown in this series (69.2 per cent.) may be more than a curiously significant coincidence.

It is on account of this periodicity of the disease that gastric ulcers frequently give long histories of digestive disturbance. Our records show that more than 52 per cent. of cases had been dyspeptics from five to twenty years before operation. Less than 20 per cent. had been affected for a shorter time than five years. During these intervals, attacks of distress ranged in frequency from one every three to five years to a gastric upset every two or three weeks. In less than 24 per cent. was the ailment continuous. The attacks varied in severity. The gastric health in the interim was generally excellent. Weight was not infrequently lost during the spells, but rapidly gained so soon as abdominal distress subsided. The average weight loss was 18.2 lb. There were instances where as much as 65 lb. were lost within a few months, or 28 lb. in rather more than three weeks. The weight loss, even if strikingly rapid, is rarely associated with the cachexia usually accompanying that in malignant disease. The systemic toxic evidences are lacking. Weight loss is only progressive so long as gastric symptoms exist in a given 'spell.' The gain when an attack passes is often astonishingly rapid. Night pain with loss of sleep, constant abdominal distress with dread of aggravating such by eating, or caution in diet on account of recent hemorrhage are important factors in the production of weight loss.

Even without gross hemorrhage, anemia not uncommonly goes hand in hand with intermittent decrease in weight. The hemoglo-

bin in our series averaged rather more than 76 per cent. The red cell count was above 4,000,000 in eight out of ten instances where hemorrhage had not recently occurred. The white count in non-perforating ulcers was rarely higher than 11,000 cells.

As we have already stated, the gastric ulcer patient generally enjoys good health between attacks. This is maintained in these intervals so long as such complications as pyloric stenosis, perforation, perigastritis or hour-glass contraction do not come on. In these events the ailment becomes continuous, with stages of aggravation.

The *symptomatology* in the attacks is largely covered by observation of epigastric pain, vomiting, hemorrhage, weight loss, weakness and anemia. The *signs* of the ailment generally consist in evidences of abdominal tenderness, alterations in gastric secretion and emptying power, phenomena elicited upon x-ray examination, and unusual findings in the stools. With your permission a brief consideration of these departures from the normal is offered.

#### SYMPTOMS.

1. *Pain*.—In 98 per cent. of the cases comprising our series, some form of gastric distress was noted.

*Character of Abdominal Discomfort*.—This is variously styled 'vague discomfort,' 'burning feeling,' 'gnawing,' 'dull ache,' or 'soreness.' In 19.6 per cent. colicky attacks were observed. Such pains were variously described as 'tearing,' 'doubling up,' 'cramps,' or 'piercing.' They were so severe as to require opiates in 9.4 per cent.

*Location, Symptomatically, of Abdominal Discomfort*.—In nearly four out of five instances pain was generally epigastric, without definite point of intensity. In 12.2 per cent. the area of maximum distress was toward the right rib margin. Fifty-two patients had sternal pain; 31 complained of general abdominal soreness, while 8 had distress in the 'small of the back.'

*Transmission of Pain*.—In about one out of 3 cases there was no transmission of distress. In the order of frequency, referred pain was noted in the right scapular region, the right rib edge, the infranavel region, between the scapulæ, the sternum, throat and nipples.

*Time of Occurrence of Pain*.—In 415 instances (83 per cent.) pain or distress had definite relation to food ingestion. It was recorded that in more than 3 out of 4 cases pain occurred within four hours following the taking of food. In uncomplicated ulcers, pain usually came on sooner after a light meal than after a large one, *i. e.*, relief by food intake was not so long maintained.

*Relation of Time of Manifestation of Abdominal Distress to the Location of Ulcer*.—Irrespective of the location of the ulcer it was



shown that nearly 80 per cent. of instances have distress within four hours after eating, nearly 50 per cent. have discomfort within three hours after food; more than 44 per cent. of lesser curve ulcers have pain one to three hours *post cibo*; nearly two-thirds of the ulcers located near the cardia have maximum distress within two hours following food intake, and two out of five within one hour afterwards.

*Pain Controls.*—Except in the acute accidents of the disease or when pyloric obstruction or ‘hour-glass’ contraction has occurred, distress in gastric ulcer is most commonly relieved by limitation of the amount or alteration in the character of ingested food (diet), the taking of food when distress is most marked (food-ease), the neutralization of acid by alkalies or by emptying the stomach (vomiting, lavage). As has already been mentioned, opiates are not infrequently required.

The observation of relief of gastric distress by food ingestion is of prime importance in diagnosis of uncomplicated peptic ulcer. If its history is constantly obtained, it is practically pathognomonic in three out of five cases. While patients, on casual questioning, frequently state that food distresses them, yet careful enquiry will elicit the fact that food does not at once cause discomfort, but that such comes on from one to four hours following ingestion. If the gastric lumen is not obstructed (hour-glass contraction) or if the pyloric channel remains patent, our observation is that the duration of food relief of pain bears direct proportion to the size and character of the meal taken. Small amounts of food give relief for a shorter period than do large, and liquid food relief is not infrequently more prompt than that obtained by solids. The dread of pain following food intake often leads to an anticipatory attitude on the part of the patient. This state of mind appears to exert a not altogether negligible influence in the production of uncomfortable gastric spasms. That this is so is readily shown by the change occurring in pain time and pain intensity following the administration of atropine or bromides. A game of golf, cards, or foot-ball very often brings about similar beneficial effects.

2. *Vomiting (Frequency).*—This is an important and often an annoying symptom. Of the 500 cases of gastric ulcer making up my series, 390 patients (74 per cent.) gave history of vomiting. There were 164 instances of non-obstructing ulcer; of this number 104 or 63 per cent. vomited. There were 336 cases where some degree of pyloric obstruction or malformation of another part of stomach obtained. Of this group, 286 cases (85 per cent.) vomited sour fluid, food or both. In all instances vomiting depended largely on character of food intake. Solid food more regularly produced vomiting than did liquid. At times of acute exacerbation of distress, the factor of gastric or pyloric spasm proved an important

cause for emesis. 'At such periods even non-obstructing ulcers frequently gave similar vomit pictures to those where there was anatomic hindrance to the onward progression of food.

'Delayed' vomiting, that is, vomiting of food that has lain in the stomach for from eight hours to several days, was exhibited by 22 per cent. of the ulcers forming the non-obstructing group and by 68 per cent. of those where ulcer scar caused some type of stenosis. Cases exhibiting 'delayed' vomiting showed varying degrees of gastric dilatation in nearly eight out of ten instances. They had frequently been treated for such. It should be emphasized that only rarely is dilatation of the stomach a disease *per se*. It is practically always but a symptom. When searched for, its cause is usually readily determined.

Of the 390 patients who vomited, 172 (44 per cent.) vomited regularly. Two hundred and three cases (52 per cent.) vomited occasionally, generally when attacks of abdominal distress occurred. When pyloric stenosis was present in various grades, vomiting was regular in 262 such cases (78 per cent.).

While vomiting is most common in ulcers involving the pylorus and the pyloric half of the lesser curvature, yet vomiting may occur wholly independent of the location of the gastric ulcer.

*Nausea* without vomit was a distressing symptom in 46 cases of this series. Pyrosis, eructations or 'water-brash' were noted in 410 cases (82 per cent.). They were very frequently both annoying and persistent and often led to overmedication or the pernicious use of stomach tubes.

3. *Hemorrhage*.—History of gross bleeding, either hematemesis or melena was obtained in 182 cases (36.4 per cent.). It is thus shown that, while such symptom, when taken into consideration with other clinical facts, is practically pathognomonic, yet only one out of three cases exhibits it. Nearly twice as many cases of gastric ulcer must be diagnosed by other signs and symptoms.

Of 182 cases that had bled, 148 patients (80.2 per cent.) had had hematemesis with or without melena. Thirty-two instances (17.1 per cent.) where melena alone had occurred were noted. Fifty-eight patients (31.8 per cent.) had shown both melena and hematemesis.

*Severity of Hemorrhage*.—The minimum number of hemorrhages was one. Several instances where from ten to fifteen hemorrhages had occurred were noted. Of those bleeding, one out of four suffered no inconvenience. In about one out of three, faintness with symptoms of shock was described. Approximately two out of five actually fainted.

*Relation of Ulcer Location to Hemorrhage*.—Hematemesis is of more frequent incidence than melena, wholly irrespective of the place occupied in the stomach wall by the peptic ulcer. It is interesting to observe, however, that melena *only* may occur with ulcers

located on the lesser curve or pars media. In general, however, melena alone means that the ulcer is situated well toward the pylorus. On the other hand, hematemesis alone may occur with an ulcer located in any position.

*Relation of Hemorrhage Incidence to the Character of Ulcer.*—Our operative examination of ulcers reveals that while ulcers in all grade of chronicity may bleed, yet approximately three out of five exhibiting this symptom show some grade of perforation.

#### THE SIGNS IN GASTRIC ULCER.

(a) *Abdominal Tenderness.*—In our series some degree of abdominal tenderness was discovered in 465 cases (93 per cent.). While the epigastrium generally is tender to deep palpation in gastric ulcer, in more than three out of four of the cases comprising this study the area of maximum epigastric tenderness was at or to the right of the midline. In 57 instances (11.4 per cent.) the greatest discomfort on palpation was elicited to the left of the midline. In 45 cases (9 per cent.) there was special tenderness in the 'pit,' irrespective of general epigastric sensitiveness. Tender ridges were demonstrated nine times (1.8 per cent.).

*Relation of Areas of Abdominal Tenderness to Location of Ulcer Demonstrated at Operation.*—Our laparotomy statistics show that nearly four out of five gastric ulcers were located at the pylorus or in the region distal to the pyloric half of the pars media. We have shown above that more than 75 per cent. of patients exhibited epigastric tenderness in the right upper, abdominal quadrant. It would seem that, when taken into consideration with other observations, points of abdominal tenderness are of certain practical value towards locating gastric ulcers. It should be emphasized strongly, however, that similar areas of epigastric distress cannot infrequently be demonstrated in pyloric spasm due to disease of the duodenum, gall-bladder, or appendix.

(b) *Alterations in Gastric Secretion and Emptying Power.*—*Test-Meal Findings.* As we have already mentioned, 336 of our cases (67 per cent.) showed some evidences of retained contents when the stomach was emptied after a twelve-hour interval. In 164 instances (32.8 per cent.) motility was not interfered with. We determined this deficiency in emptying power by the simple procedure of taking the patient off 'diet,' administering a mixed meal containing boiled rice and twenty raw raisins, and then searching for food remains after twelve hours. From the personal examination of nearly 8,000 stomach extracts, I learned that only the persistent demonstration of food retained in a stomach longer than ten hours has definite significance towards the proof that the gastric lumen is not patent. Retention of food for from four- to eight-hour periods is readily demonstrated, *intermittently*, where



pyloric or gastrospasm exists, with hyperacidity associated with vagotonia, gall-bladder disease, duodenal irritation, or appendicitis. The persistent finding of test-food remnants after a twelve-hour interval is an indication for surgical intervention. Dilatation of the stomach generally co-exists in such cases, but is a secondary, compensatory change.

*Acidity of Gastric Extracts.*—In the retention cases the average free HCl was 56.4; the average total acidity, 74.2, and the combined acids and salts, 17.8.

In non-retention gastric ulcers the free HCl averaged 40.5; the total acidity, 52.4, and the combined acidity, 11.6.

It was observed that the highest gastric acidities were uniformly determined in acute and subacute perforating ulcer; that in simple, chronic gastric ulcer the figures closely resemble those returned from cases of *ulcus carcinomatosum* and of chronic gastritis. Where recent bleeding had occurred, the free HCl averaged 35, the total acidity 48, and the combined acid and acid salts, 13.5. These figures very closely resemble those of early malignancy or malignant ulcer. In chronic ulcer of *benign* type, *with retention*, there is an increase both in free HCl and total acidity. This is in sharp contrast to instances of retention developing in *malignant* ulcer, where, as stenosis occurs, free HCl is *progressively lowered*, while total acidity correspondingly increases.

Blood macroscopically or by the benzidin or guaiac tests was noted in 39 per cent. of gastric extracts. Frequently such blood came from tube manipulation and had no apparent relation to the activity or quiescence of the peptic ulcer. Very often patients were tubed within forty-eight hours following severe hemorrhage without blood being noticed in the removed test meal.

While we are considering the incidence of blood in gastric extracts, it might be useful to call attention to the fact that chronic gastric ulcers bleed only intermittently. To anyone who has observed the pathological alteration occurring at a point where an ulcer is situated, the reason for this intermittent bleeding is evident. An ulcer cannot exist for very long without a tissue reaction occurring at its edges. This tissue reaction is at first the hyperplasia of repair. It results in the production of scar tissue. Unless the ulcer progresses very rapidly and the proteolysis results in destruction of vessels of fair size, hemorrhage rarely occurs. The bases and edges of most ulcers are usually clean. The pathological explanation is sufficient to warn us not to expect too frequently blood either in gastric extracts or stools.

On account of this intermittent bleeding in gastric ulcer, so-called raw granulating surfaces occur only at times of activity of the process. It is thus seen that such technical manoeuvre as the localization of an ulcer or the determination of its existence by

means of the 'string tests' as suggested by Einhorn and others, has *more* than a *limited* diagnostic value. We have made observations with the 'string test' upon 318 cases of gastric ulcer. In only 7 instances were we able to observe definite blood stains upon the test string. These stains were practically always at a distance approximating that where we theoretically locate the pylorus. Knowing the pathological fact that two-thirds of all ulcers are located in the pyloric third of the stomach, it is not difficult to prognose, when a blood stain occurs upon a string, that a suspected ulcer will be in the pyloric region. One can do this quite well without the use of a test string. It should also be emphasized with respect to the 'string test' that gastric and jejunal peristalsis carry the string forward in the straightest possible line. From experience in passing duodenal tubes upon thread guides, we have convinced ourselves that after a string has been in the stomach or jejunum for six hours, it closely hugs the lesser curvature and the superior surface of the pylorus. Knowing as we do the variation and the character of gastric ulcers, one can readily see how many strings actually never come in contact with ulcer surfaces. In cases where there is pyloric stenosis, the diagnostic value of the 'test string' is almost nil, for the simple fact that the string frequently does not reach the ulcer.

*Blood in the Stools.*—As we have stated above, the intermittency of bleeding in gastric ulcer warns us never to delay diagnosis of such until the appearance of occult blood is noticed in the stool. In our cases rather more than 31 per cent. gave positive benzidin or guaiac reactions in the properly prepared stool. Unless the stool is properly prepared, one may obtain positive chemical tests for blood in specimens from the majority of suspected ulcers examined. Such reaction usually comes from material ingested as food. To eliminate this error, we have found it necessary to place our patients, after thorough catharsis, upon meat-free diet for at least forty-eight hours, and then upon absolute milk diet the twenty-four hours preceding the time for the collection of the stool. If this technique is adhered to, the chemical finding of blood in a patient, *with an ulcer history*, is then of significance with regard to telling us of the activity of the ulcer more than as a diagnostic aid in telling us that an ulcer is present. This information is particularly useful in cases where one suspects that malignant change has taken place in an ulcer edge. Malignant ulcers are apt to break down quickly, and in such cases chemical tests for blood in the stools are positive with fair constancy.

*X-Ray Evidence of Gastric Ulcer.*—Our observations are based upon a personal study of the reports of nearly 1,700 examinations of patients with gastric symptoms. All patients were examined both by the fluoroscopic and plate method. We believe that the

internist should personally fluoroscope his patient or at least be present at such examination. He should also make a practice of studying and comparing plates with the chemical and operative findings. In this series there were 126 proved instances of gastric ulcer.

It is well to state that in uncomplicated gastric ulcer, the *x*-ray evidences as shown by the plate method are largely accidental. By uncomplicated ulcer I mean ulcer in which pyloric stenosis has not occurred, where types of hour-glass contraction have not taken place, where malformation of the stomach outline by excess of scar tissue has not ensued, where perforation is absent or crater ulcer does not exist. When it is recalled that the *x*-ray plate in gastric work is but a silhouette of the bismuth-filled stomach at one instant of its exposure, it is readily seen why *x*-ray plates do not locate all ulcers. Further, when we realize that less than 60 per cent. of chronic gastric ulcers are of the complicated type, it is not difficult to appreciate that many ulcers must escape recognition in the *x*-ray plate. The most important evidence returned by the *x*-ray plate is the demonstration of various types of stenosis, the indication of the size of the stomach, differentiation between a simple ulcer and a gross carcinoma, and the relation of the stomach to adjacent viscera. Many of these facts can be determined more quickly and far less expensively by simple clinical methods such as we have already outlined.

It is safe to say that while in a given case it is extremely desirable for purposes of record to have *x*-ray plates made of the bismuth-filled stomach, the *x*-ray examination, by means of the fluoroscopic screen returns, gives the greatest amount of information in far shorter time and at less expense to the patient. One admirably supplements the other type of examination, but it is difficult to see, after any amount of clinical experience, how the plate method alone can satisfy the clinical needs. The fluoroscope itself is not infallible in determining the presence or absence of gastric ulcer. Its range of activity is greater than that covered by the plate method, because, within a few minutes, one can see the stomach in a great variety of phases of activity and can add to this visualization the changes in gastric action that may be brought about during abdominal palpation. As results of these added advantages, one not infrequently proves the existence of an ulcer where the plate had been negative or shows that what appeared pathognomonic of uncomplicated ulcer in the plate is but an artifact or is due to some cause, extra-gastric in origin. This is particularly the case when the patient is fluoroscoped at several sittings before and after the use of atropine or belladonna to relax pyloric or gastric spasm.

From the above it must not be understood that in our opinion the *x*-ray examination of patients is valueless. On the contrary,



we consider that facts of great importance are often obtained by the *x*-ray technique. Clinically, we have come to regard *x*-ray examinations as having the same relative worth as a differential blood count has in cases of anemia. While frequently nothing is added to the clinical picture, there are occasions when the diagnosis is *given* by such examination. It is certainly to be deplored that unproved and wild statements have been made regarding the absolute diagnostic worth of the *x*-ray examination of the bismuth-filled stomach. The procedure is so largely a mechanical one that no hard-and-fast rules can be laid down with respect to diagnostic signs as returned by its application. The interpretation of what is seen or felt by the plate or in the fluoroscopic examination is highly individual. Added danger from the use of these mechanical procedures, clinically, is to be found in the fact that in the novelty and the perfection of the mechanical device, clinical cerebration tends to decline, and simple, well-proved methods of diagnosis are forgotten. It is my custom to *terminate* the examination of a gastric case with *x*-ray examination. In fully 85 per cent. of our cases the diagnosis has been well established before the *x*-ray findings are observed.

#### PROGNOSIS OF GASTRIC ULCER.

The clinical course of any gastric ulcer is highly individual. While it is true that we have undoubted histological proof that many ulcers heal, we have yet no means of determining, clinically, in a given case, whether or not such ulcer will heal in its acute stage, will tend to benign chronicity, or will become the basis of a future cancer. It is reasonable to suppose, however, from the mass of data, carefully studied, which has accumulated during the past decade, that many gastric erosions and simple ulcers have a natural tendency toward healing. This not uncommonly occurs wholly irrespective of the clinical type of treatment that is carried out. It is also a commonly observed fact that a given ulcer will tend to chronicity and recurrence in spite of all known methods of therapy. In such cases, prognosis is largely dependent upon intensely individualized pathology. If the process continues benign, the resultant condition demanding treatment is largely accidental. Pyloric stenosis with gastric dilatation, hour-glass contraction, perforation involving other viscera, or malignant degeneration may occur without regard to our clinical care. Each case is a law unto itself. In many instances of chronic gastric ulcer, the ulcer itself heals, but in the healing complications occur which generally require surgical treatment.

We have no known means of telling, clinically, in any case of gastric ulcer, and particularly in those gastric ulcers which run a chronic course, what the ultimate outcome will be. The life history of the

affection seems to depend upon unknown factors. It is coming to be more generally recognized, however, that gastric ulcers of the chronic type which have a tendency to frequent recurrences not uncommonly terminate in malignancy. We do not know how often such transition takes place. It should not be understood that all chronic gastric ulcers become malignant. It should, however, be firmly emphasized that, in a given chronic gastric ulcer, we have at present no means at our command that enable us to tell which chronic ulcer is destined to pursue a benign course and which will become malignant. The future course of chronic gastric ulcer is dependent wholly upon tissue reaction to hyperplasia. When the clinical pathologist is not uncommonly unable to differentiate between benign and malignant hyperplasia, it is very difficult to see how the internist is to be expected to prognose the future course of any gastric ulcer. Certainly, from our studies of gastric cancer, it would seem, however, that more cases of this affection developed from previous benign ulcer than has heretofore been generally recognized.

In a recent study\* we analyzed 566 consecutive cases of operatively and pathologically proved gastric cancer. We showed that the sex ratio in these cases was approximately that of chronic gastric ulcer; that the average history of the affection before evident malignancy occurred extended over 11.4 years in two out of three cases; that the supervening period of evident malignancy averaged 6.1 months; that but 1 out of 3 cases of gastric cancer had no previous dyspeptic history; their whole course averaged 7.1 months; that of the entire series, in 92 cases where hemorrhage had been noted, the bleeding occurred in nearly 63 per cent. of those with previous ulcer history, and that of the whole number bleeding, 52 per cent. had bled two years prior to their coming under observation; that of those who bled within the two-year period, 77.5 per cent. of the cases fell into that group with ulcer history previous to a period of evident malignancy; that in but 55.4 per cent. was free HCl acid absent in the gastric extract, and that in 31.5 per cent. it ranged between 20 and 50.

While the above facts are not to be taken as an indication that the majority of chronic gastric ulcers become malignant, they certainly emphasize that the accuracy of our prognosis of the future course of any chronic ulcer is highly limited and frequently impossible. While malignancy supervenes often enough wholly irrespective of our methods of treatment, it is rational to state that therapeutic measures, which keep the stomach clean bacteriologically and which tend to minimize sources of tissue irritation, should be thoroughly carried on so long as surgical complications

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\*Smithies: The Relation of Gastric Ulcer to Gastric Cancer. (*Journ. Med. Assoc.*, 1913, p. 1793, November 15th.)

have not occurred, or a continuous and progressively downward affection has succeeded one which was before periodic and without symptoms of malignant intoxication. When in doubt as to the actual pathology existing in a given case, patients should be urged to submit to laparotomy. For it should be remembered that the cases of gastric cancer early diagnosed and surgically curable are those in which the clinical symptomatology is that which we associate with chronic gastric ulcer.

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## CARDIAC DILATATION THE CAUSE OF SUDDEN DEATH.

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Tulane University.

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There are few diseases that tax the knowledge and skill of the physician more severely than cases of chronic interstitial nephritis with general sclerosis, especially when complicated with obesity, in which the heart is weakened and dilated.

Proper treatment can prolong the lives of these unfortunates, make them stronger, more comfortable, and useful to themselves and families. An examination of the records of such cases, taken during the past ten years, brings out this fact so strongly that it has impelled the writer to publish some of the more interesting histories. A study of these cases strikingly shows that those who are anxious to become well, and who sacrifice business and pleasure in order to encompass that end, are usually rewarded by a prolongation of their ebbing lives.

We frequently meet patients so afflicted. They are individuals who are to all appearances healthy and robust, yet, their friends and families are amazed and appalled at their sudden end.

Apoplexy, acute indigestion, acute Bright's disease, heart rupture, pneumonia and the haphazard diagnosis of heart failure, etc., are usually attributed as causes of death. Yet a careful investigation will show a great majority of these cases to be analogous to those the writer is reporting.

There is no doubt but that the early recognition and treatment of this condition would greatly lengthen the lives of those afflicted.

The interesting statistics of Harlow Brooks bear out the writer's contention. He says out of 457 post-mortem cases, when death was credited to cardiac diseases, 330 heart walls were diseased sufficiently to cause death, and in many others heart walls contributed to the fatal ending; yet a considerable number of myocardial diseases were not recognized during life, "though, of course, much might have been done to arrest and control them."

Romberg also says that these are the most common of heart affections, occurring between the ages of forty and sixty-five in men, and later in women.

The few cases that the writer is reporting (in the treatment of which he had the good fortune to assist) are taken from the clinical records of Dr. Lerch; they are of interest.

CASE I.—Cotton merchant and planter, *aet.* fifty-three, born in Germany. Regular drinker, hearty and rapid eater; meals principally of soups, meats, and starchy foods. Drinks copiously of water. Family history good, except that obesity is a family characteristic.

Was examined in November, 1910. Was obese. Weighted 238 lb. and was 5 ft. 8 in. tall. Lips and face cyanosed. Pulse 100, regular and full, arteries sclerosed. Heart found dilated, 15 cm. in width, but sounds pure. Lungs emphysematous. Urine contained albumin and casts. Dyspnea after exertion. Six months afterwards a reexamination showed the following improved condition: Heart very much diminished in size, width 13.5 cm., blood-pressure 178 mm. Hg., and a very marked diminution of albumin in urine.

In October, 1912, he was again observed. His general condition was very much better. Heart 13 cm. in width, blood-pressure 168 mm. Hg., weight reduced to 197 lb. (See Fig. 1.)

The patient's condition gradually improved from the time of his first visit, and the last time he was examined he was found to be in better health than he had been for years. Weight was reduced 40 lb., blood-pressure down from 200 to 168 mm. Hg., cyanosis gone, dyspnea disappeared.

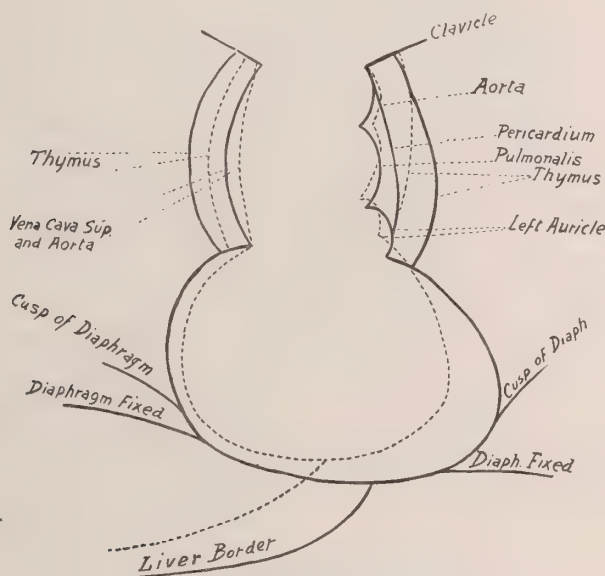


Fig. 1.—Illustrating Case I.

Here was a man with a greatly dilated heart and interstitial nephritis, who in three years gradually improved, whose heart diminished in size, who was reduced in weight, and felt so well that he could not be induced to think that he was seriously ill.

A few months after his last visit to the office he died of myocarditis under the care of another physician, whose treatment consisted of very large doses of the thyroid extract for the nephritis. Here is a case in which, if a correct diagnosis had been made and proper treatment administered, the patient's life would have been indefinitely prolonged.

CASE II.—Mrs. K., *aet.* fifty, presented herself for treatment April 22nd, 1904. Did not use alcohol, coffee or tea. Had a moderate appetite and lived principally on meat. Did very little work, lived mostly indoors. Mother living and is eighty-two years of age. Father died of apoplexy, had one brother who died of cirrhosis of the liver. She had the usual diseases of childhood. Complained of nervousness, rheumatic pains and hyperacidity. Was 5 ft. 3 in. tall and her usual weight was 175 lb. Urine contained casts and albumin. The diagnosis of chronic interstitial nephritis was made. Pulse regular and the heart normal.

The following summer she had an acute exacerbation of the nephritis. Was reexamined in April, 1912. Enlarged heart, 12.5 cm. in width, some arrhythmia, second aortic sound accentuated and ringing, blood-pressure 165 mm. Hg. Liver border hard and smooth. Urine contained some traces of albumin and some casts.

Was seen again in the spring of 1913, and found improved. Heart 12 cm. in width, pulse 88 regular, blood-pressure 118 mm. Hg. Urine had been free of albumin for the previous six months and many times during the course of treatment. The patient was in much better condition than she had been in ten years.

In Asheville, N. C., last summer, she had frequent attacks that were diagnosed as 'indigestion,' and was treated for the same. Immediately on her return to the city the writer was hurriedly called and found the patient in a moribund condition, and in spite of all that was done she succumbed in a few minutes.

Again here is one of these frequent cases of nephritis with cardiac complications, living in perfect comfort for ten years, steadily improving, the heart contracting practically to its normal size, the albumin completely disappearing for quite a while, just as long as she was regularly observed and properly treated.

CASE III.—A. L., German, *aet.* sixty-five, a carpenter and contractor by occupation. Was a heavy drinker up to twenty-two years ago, at which time he discontinued drinking and abstained until within the last six years. Was a hearty eater, principally of meat and coarse foods, highly seasoned.

Father and mother died of unknown causes, and one brother died of dropsy. Has had malaria, yellow fever, doubtful history of syphilis. Claims that he was well until last year. Was taken with dyspnea and cough after an attack of the grippe.

Face waxy, eyelids puffed, marked dyspnea and orthopnea. Tongue coated, breath fetid, conjunctivæ pale, injected edema of feet and ankles and legs up to the knees. Weighed 194 lb., 6 ft. tall. Pulse 80, blood-pressure 168, arteries hard and contracted and sclerosed. Heart very much enlarged, sounds faint, impure and dull.

Bronchitis, and marked congestion of lungs, with edema and large moist râles. Urine 1018, free of albumin and casts. As Fig. 2 will show, patient improved, and heart diminished in size. Did not report until the following November; worry about a large contract again taxed the heart; was once more improved.

Did not see him until a few hours before his death, as he had changed physicians and the writer was only called immediately before end. Patient was hard to control, following directions in a haphazard way, otherwise he might have been living to-day.

CASE IV.—M. A., *aet.* forty-eight, born in Alabama. Merchant, always was a hard worker. Had long hours and a great deal of worry. Was a heavy eater. Had typhoid when a child.



Six years ago while at the telephone had a syncope which lasted for quite a while, presenting all the symptoms of a severe heart failure. Was examined shortly afterwards and the heart found greatly dilated, 14.5 cm. in width. Pulse, 90 regular. Blood-pressure, 140 mm. Hg. Liver enlarged and border hard to the touch, spleen normal in size. Urine free of albumin and casts.

He was examined at frequent intervals during the following four years, and was markedly improved.

In spite of frequent warnings as to his precarious condition, and the advice given anent the observance of precautions, he neglected himself, and two years after his last consultation, he died suddenly following an outburst of anger after a hearty meal.

The other is a similar case in which negligence and the love of the good things of life have been the cause of an early death.

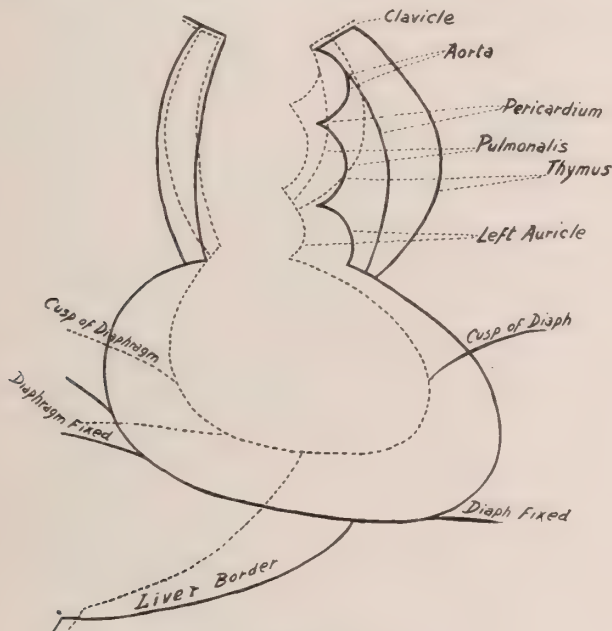


Fig. 2.—Illustrating Case III.

CASE V.—Male, aet. forty, born in Germany, in New Orleans twenty-eight years, single, applied for treatment in 1908. Had a good appetite, heavy eater and drinker. Drinks beer and wine with meals and during evenings, claims that he drinks over a gallon of beer daily.

Mother died of heart disease when seventy-two years old, father of pneumonia at fifty. The patient had typhoid and pneumonia twenty years ago. Gives a doubtful history of syphilis. Complained of dyspnea; noticed it five years before and was treated for same. Urinates frequently at night, especially after imbibing a great deal of beer. His usual weight was 165 lb. At the time of examination weighed 197 lb. Heart slightly enlarged, sounds pure, except for the accentuation of the second aortic sound. Lungs emphysematous. He had a very large protruding abdomen; urine free.

The patient was treated for a short while and the reduction easily accomplished, but unfortunately the desire for food and drink was stronger than the

will. He ceased treatment and soon gained the weight that he had lost. Three years after, the writer heard that he died suddenly of apoplexy.

Had he taken care of himself and reduced his weight, improved his physical condition, the writer does not doubt but that he would be living to-day and enjoying health.

These two cases show that we cannot be too careful, and must not slight these serious conditions. The prognosis of these cases was very much more favorable and the condition of the patient very much better than in the following cases that are to-day living.

CASE VI.—R. H., in the cotton business, *aet.* sixty-one, of exemplary habits. Father died at the age of thirty-nine of apoplexy and mother of tuberculosis. Has had the usual infectious diseases. Complained of backache, frequent urination, migraine, and dizziness. Face cyanotic, finger-joints enlarged, and for the last fifteen years. 5 ft. 8 in. tall, 159 lb.; pulse 62 and weak, arteries soft. Heart normal in size and sound. Liver border readily palpable, spleen normal, urine contained traces of albumin and casts.

In 1909 the patient was reexamined. The heart was found very much enlarged, 16½ cm. in width, blood-pressure 144 mm. Hg.

In 1910, he sought treatment for occasional shortness of breath. Pulse was 76; blood-pressure 130 mm. Hg.; heart diminished but still enlarged 14 cm. Sounds pure, except for accentuation of second aortic sound. Kidneys small by percussion. The last time he was seen was in 1913. Blood-pressure 120 mm. Hg., heart sounds weak and distant, heart about 12 cm. in width, and some emphysema of lungs.

This patient who takes proper care of himself, and avoids any imprudence, is well to-day, and although now in his seventy-third year he is still active and continues his occupation in spite of disease of heart and kidneys, with the general sclerosis, and may round out many more useful years.

This patient particularly shows how much one can accomplish in the treatment of this trouble. It is plain to see that his condition was precarious. He is not only still alive, but he is stronger and healthier than before treatment, and the prognosis to-day is very much more favorable than it was six years ago when the writer first saw him.

CASE VII.—M. C., was examined in 1908, *aet.* sixty-one, born in Kentucky. Lumberman, worked very hard to within the last six years, and endured much exposure.

Very heavy drinker, at times as much as one quart of whiskey a day. Smokes and chews continuously.

Father and mother both lived to advanced old age. Has had scarlet fever, typhoid and malaria. Complained of dyspnea, occasional dizziness, and frequent headaches when constipated. He has had attacks of aphasia covering several hours and loses control of hands. 6 ft. tall, and weighed 225 lb. Patient appeared haggard and with a worried expression. Color ruddy. Has arcus senilis. Conjunctivæ injected. Pulse 67, marked arrhythmia with occasional drop of a beat. Blood-pressure 172 mm. Hg. Heart enlarged 13.5 cm. in width, second sound split. Urine very acid and contained albumin and casts.

Three years afterwards the following improvements were found: Pulse 65; arteries sclerosed; blood-pressure 148 mm. Hg.; heart 13 cm. in width, with pure sounds and still an occasional loss of beat. Weight 185 lb.

To-day patient is in better health than for years previous. The heart is normal in size, pulse regular, 80, full and strong; blood-pressure 150 mm. Hg. The shortness of breath has disappeared and he feels healthier and stronger. (See Fig. III.)

In all these cases the frequent stretching of the cardiac muscles must be recognized, and to do this it is absolutely necessary to make out the size of the heart. The danger point is its sudden dilatation, and its early recognition constitutes the safety of the patient.

All these cases of cardiac dilatation and intense blood-pressure respond readily to treatment. In a few days the heart diminishes practically to its normal size; and, as a rule, with a pronounced drop of blood-pressure the discomfort disappears, dyspnea vanishes, and the patient is not only relieved but the imminent danger of death is minimized and often removed for a long period of time.

Grassman insists that the heart should be systematically examined at intervals, just as are the teeth. If this could be possible it would without doubt greatly reduce the death-rate between the ages

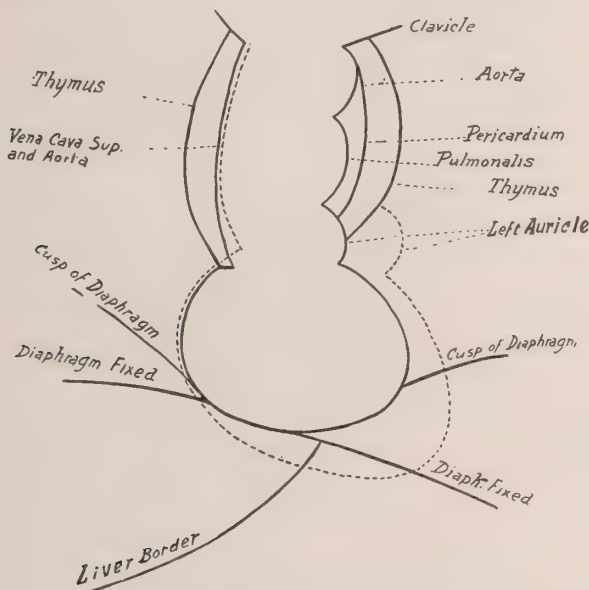


Fig. 3.—Illustrating Case VII.

of forty-five and sixty, for it is very nearly a daily occurrence to observe these dilatations.

The writer fully agrees with Gibson that the size of the heart should always be ascertained. But percussion is alone sufficient and the most accurate method at our disposal. Percussion is an individual art. There are numerous methods, some more or less accurate. Lerch's drop method is used, for it is ideal in its simplicity and absolutely accurate.

The *x*-ray may be used, but it is impracticable on account of its great expense, the bulkiness of the apparatus, and especially its inability of use at the bedside.

The writer has seen patients walk to the office with enormous hearts, blood-pressure 230 mm. Hg., or more, with palpitation,



dyspnea, cyanosis, with some edema, and with scanty urine full of albumin and casts, who, when put to bed and treated, in a short while lose all these symptoms; and, the writer may say, sometimes as soon as the next day they are very much improved, and in a few days it is hard to realize that there is not a trace of their previous condition.

In these cases of dilated heart at frequent intervals, patients educated to consult their physician immediately upon feeling any of the warning symptoms, have, by so doing, prolonged their lives.

If the patient is willing to abide by the advice given him, and anxious to regain health, we will meet with success with the majority of these patients. But without their cooperation we are doomed to failure.

The cases presented graphically show this. Those who were in better physical condition, whose prognosis was more favorable, and who neglected themselves or underestimated the severity of their disease, died. But those who were more seriously sick, whose organs showed greater degeneration, yet gave themselves care and attention, and appreciated their dangerous condition, responded to treatment and are alive.

It is astonishing what treatment will do, how these greatly dilated hearts will contract nearly to their normal size, increase in strength with a dropping of blood-pressure; how edema will subside, how dyspnea, orthopnea, cyanosis and anginoid pains will disappear, and the patient rapidly change to a practically well man.

Unfortunately we hear of leaders of the profession who do not want to recognize and appreciate the good that may be accomplished by our therapeutic means, and who are so influenced by their scepticism and the result of their work that they are blind to the light of success.

It seems to be an opinion firmly rooted that we cannot diagnose these cases of myocarditis. Cabot says that he has given up attempting to diagnose chronic myocarditis, "in it diagnosis is a mere matter of luck, it has no clinical symptoms, no characteristic physical signs." And Allburt deplores that we have no scientific measure and the clinician has no valid test of the reserve strength of these diseased hearts, and what they can do in case of need.

These frequent enormous dilatations with their corresponding circulatory disturbances are no doubt the most efficient means of diagnosing myocardial affections, and the best method for so doing is found in Lerch's percussion. The tone of these hearts and the amount of reserve strength can readily be ascertained by noticing the difference in pulse-rate between the reclining and upright position.

If the proportion between the two remain within normal bounds, the heart is capable of accommodating itself to extra work; if the

difference is greatly increased, these cardiac muscles are weak and caution is indicated.

Fatty degeneration is the end of all diseases of the heart which fails, and in all these cases reported fatty degeneration must have taken place.

Satterthwaite says there is no doubt that the fatty heart tends to degenerative changes.

The early recognition of these dilatations and their accompanying dangerous conditions is the means of prolonging many lives.

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## EXPERIENCES WITH THE ABDERHALDEN SERUM DIAGNOSIS REACTION FOR CARCINOMA.

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By OSCAR BERGHAUSEN, B. A., M. D., of Cincinnati.

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(From the Laboratory of the Cincinnati General Hospital.)

In this report there will be considered only certain results obtained and observations made after many months of experience with the Abderhalden dialyzing method. We have followed the original technique in the main, insisting upon using only such apparatus as had been sterilized, and handling all tissues, thimbles, etc., with sterilized forceps. It was found better to preserve all tissues in pure toluene and to boil them in weak acetic acid solution immediately before use. For many months we were unable to get satisfactory results. It was found, however, that dialyzing the serum before adding the tissues, and then changing the containers, constituted an important deviation from the original technique, in so far as the serum was thus freed from any substances giving the reaction, before tissue digestion was permitted. All positive reactions were immediately controlled by testing the serum alone in the same thimble over a similar length of time. When trustworthy results had been obtained with prepared placental tissue and serum from pregnant and non-pregnant individuals for the diagnosis of pregnancy, then the study of the serum diagnosis of cancer was undertaken.

It was soon found that the serum obtained from an individual afflicted with carcinoma would digest certain cancer tissues and not others. Usually better results were obtained when such tissues were selected as corresponded to the region most probably affected in the patient under observation. Thus serum obtained from a patient suffering from a condition clinically diagnosed as carcinoma of the stomach (No. 7) digested stomach carcinoma tissue only. Again, negative results were obtained with known carcinoma serum until other tissues had been tried. The writer assumed that the ferments were specific for certain proteids and therefore put in a negative report only after various tissues had been tried. These results were discussed with Prof. Paul G. Woolley, Director of the Laboratory, and it was thought probable that the embryonal origin had considerable to do with the problem. Since then we aim to select such tissues for trial as most probably represent the anatomic pathology of the case. More often three different types of tissue are selected—namely, of epi-



blastic, hypoblastic, and mesoblastic origin. Serum obtained from a patient suffering from beginning carcinoma of the stomach digested hypoblastic tissue only. Serum obtained from an individual suffering from carcinoma of the large intestine, not involving the anus, digested hypoblastic and mesoblastic, but not epiblastic tissue. If this be true, then we are dealing with a tumor which began in the hypoblastic tissue of the intestines, and by spreading has involved either the tissue originating from mesothelium as represented by the peritoneum or striated muscle, or the mesenchymatous structure as represented by the supportive connective-tissue, blood-vessels proper, or the blood. Serum obtained from an individual suffering from a sarcoma of the kidney digested mesothelial tissue only, as represented by tissue obtained from an adenoma of the ovary.

A careful consideration of the tabulated results will show that the tendency was toward digesting certain tissues only, after the manner discussed above, but that occasionally contrary results were obtained. Thus No. 15, under the heading of cases clinically malignant, was an enlargement of the lymph-glands of the neck, limited to the left side. A section was removed and studied and found to be a typical medullary carcinoma, with a tendency to areas of degeneration and giant cell formation, somewhat resembling a tuberculous process. No primary focus of malignancy could be found upon clinical examination. The serum of this patient gave a distinct reaction to No. 1,152, a sarcoma of the breast; only a slight reaction to No. 1,059, a medullary carcinoma of the stomach; and a negative reaction to No. 1,081, an adenocarcinoma of the breast. The lymph-glands of the neck are mesoblastic in origin, and this patient's serum digested mesoblastic tissue of the breast as represented in No. 1,152; and also digested less strongly a medullary carcinomatous tissue of its own structure but hypoblastic in origin. Again the serum of a patient, suffering from carcinoma of the liver, digested a medullary carcinoma of the breast, but not a carcinoma of the same origin. This patient died, and an autopsy revealed a typical diffuse carcinoma of the liver, which was probably primary in the gall-bladder, and a typical metastatic carcinoma of the pancreas. The serum of a patient afflicted with carcinoma of the stomach failed to digest the above-mentioned pancreas carcinoma, also No. 1,334 and No. 1,298, but did digest an epiblastic tissue as represented by a scirrhus carcinoma of the breast. Therefore, we are not prepared to state that the carcinoma of the stomach was scirrhus in nature. Unfortunately an autopsy was not permitted.

## PATHOLOGICAL TISSUES EMPLOYED.

The following tissues were properly prepared, bottled in toluene, and dried with sterile filter paper immediately before use:—

- No. 910: Peri-urethral tumor, epithelioma malignant.
- No. 913: Scirrhus carcinoma of the breast with pseudocysts.
- No. 1,020: Epithelioma of the jaw with keratinization.
- No. 1,021: Adeno-fibroma of the breast.
- No. 1,046: Fibroma of the breast.
- No. 1,033: Fibromyoma of the uterus.
- No. 1,037: Carcinoma of the breast.
- No. 1,058: Uterine fibromyoma.
- No. 1,059: Medullary carcinoma of the stomach.
- No. 1,081: Adenocarcinoma of the breast.
- No. 1,086: Epithelioma of the cervix.
- No. 1,139: Scirrhus carcinoma of the breast.
- No. 1,144: Adenofibroma of the breast.
- No. 1,152: Sarcoma of the breast.
- No. 1,171: Medullary carcinoma of the breast.
- No. 1,176: Intracystic adenoma of the ovary.
- No. 1,298: Hypernephroma.
- No. 1,318: Adenocarcinoma, springing from the body of the uterus.
- No. 186,827: Carcinoma of pancreas, secondary.
- No. 1,334: Adenocarcinoma of breast.

For the pathological examination of these tissues, the writer is indebted to Prof. Paul G. Woolley and Dr. Thomas Kelly.

## REACTIONS FOR PREGNANCY.

- |                                  |          |
|----------------------------------|----------|
| 1. Mrs. K., 5 months.....        | Result + |
| 2. Advanced pregnancy . . . . .  | Result + |
| 3. Four days after delivery..... | Result + |

## CONTROLS.

- |                                      |          |
|--------------------------------------|----------|
| 1. Mr. M. . . . .                    | Result — |
| 2. Mrs. W., syphilis of liver.....   | Result — |
| 3. Mrs. G. . . . .                   | Result — |
| 4. Mr. B. . . . .                    | Result — |
| 5. Mrs. T., carcinoma of uterus..... | Result — |
| 6. Man . . . . .                     | Result — |
| 7. Mrs. V., carcinoma of uterus..... | Result — |

## REACTIONS FOR MALIGNANCY.

*Control Cases.*

- | Clinical Diagnosis.             | Result.                       |
|---------------------------------|-------------------------------|
| 1. Iritis . . . . .             | Negative to No. 913.          |
| 2. Myelitis . . . . .           | Negative to No. 913.          |
| 3. Syphilis . . . . .           | Negative to Nos. 913 and 910. |
| 4. Syphilitic iritis . . . . .  | Negative to No. 1,020.        |
| 5. Advanced pregnancy . . . . . | Negative to No. 1,020.        |
| 6. Tabes dorsalis . . . . .     | Negative to No. 1,020.        |
| 7. Pregnancy . . . . .          | Positive to No. 1,020.        |

Clinical Diagnosis.	Result.
8. Syphilis . . . . .	Negative to Nos. 1,037, 1,033, 1,059 and 910.
9. Mastoiditis . . . . .	Negative to Nos. 910 and 1,059.
10. Syphilis . . . . .	Negative to Nos. 910 and 1,059.
11. Syphilis . . . . .	Negative to Nos. 910 and 1,059.
12. Cerebral hemorrhage . . . . .	Negative to Nos. 1,020 and 1,033.
13. Paresis . . . . .	Negative to Nos. 1,086, 1,081, 910 and 10.21.
14. Syphilis . . . . .	Negative to No. 910.
15. Endometritis . . . . .	Negative to Nos. 1,081, 1,171, 1,033 and 910.
16. Syphilis . . . . .	Negative to Nos. 1,152 and 1,176.
17. Syphilis and elephantiasis . . . . .	Negative to Nos. 1,021, 1,144; slightly positive to No. 1,037.
18. Empyema of thorax . . . . .	Slightly positive to No. 1,081; strongly positive to No. 1,176; positive to No. 1,144; negative to Nos. 1,059 and 1,152.
19. Pleurisy with effusion . . . . .	Negative to Nos. 1,176, 1,081 and 1,059.
20. Syphilis of liver . . . . .	Negative to Nos. 1,081, 1,059 and 1,152.
21. Pulmonary tuberculosis . . . . .	Negative to Nos. 1,152 and 1,037.
22. Tuberculosis of spine . . . . .	Very slightly positive to No. 1,134; negative to No. 186,827.

## CASES CLINICALLY MALIGNANT.

Clinical Diagnosis.	Result.
1. Cancer of the jaw . . . . .	Positive to No. 913.
2. Large round-celled sarcoma of hard palate . . . . .	Positive to No. 913.
3. Carcinoma of cervix . . . . .	Positive to No. 913.
4. Epithelioma of jaw . . . . .	Before operation, negative to Nos. 910 and 913; after operation, positive to his own tissue, No. 1,020; negative to No. 1,171.
5. Carcinoma of cervix . . . . .	Positive to No. 1,020; negative to No. 1,033.
6. Carcinoma of cervix . . . . .	Positive to No. 1,020.
7. Probable tumor at the pylorus of stomach . . . . .	Negative to Nos. 910, 1,037, 1,048, 1,021 and 1,033.
8. Epithelioma of penis . . . . .	Positive to Nos. 1,020 and 1,081; negative to No. 1,037.
9. Cancer of the breast . . . . .	Positive to No. 1,081.
10. Carcinoma of cervix . . . . .	Positive to Nos. 1,086, 1,081, 1,021; negative to No. 910.
11. Carcinoma of cervix . . . . .	Positive to No. 910; negative to No. 1,081.
12. Syphilis and epithelioma of skin . . . . .	Negative to Nos. 1,171, 1,152, 1,033, 1,081, 910, 1,139; positive to Nos. 913 and 1,176.
13. Sarcoma of kidney . . . . .	Positive to Nos. 1,152 and 1,176; negative to Nos. 910 and 1,059.
14. Carcinoma of large bowel . . . . .	Negative to Nos. 1,171, 1,081 and 1,176; positive to Nos. 1,059 and 1,152.
15. Medullary carcinoma of lymph glands of neck (primary focus not known) . . . . .	Negative to No. 1,081; slightly positive to No. 1,059; distinctly positive to No. 1,152 only.
16. Carcinoma of liver . . . . .	Negative to No. 1,059; positive to No. 1,171.



## CASES IN WHICH MALIGNANCY WAS SUSPECTED.

Clinical Diagnosis.	Result.
1. Chronic dysentery . . . . .	Negative to Nos. 910 and 1,059.
2. Uterine hemorrhage . . . . .	Negative to Nos. 1,081, 1,171 and 910; slightly positive to No. 1,033.
3. Fibroid of uterus (malignancy?) . . . . .	Positive to Nos. 1,037, 1,081 and 1,020; operation disclosed inoperable carcinoma.
4. Tuberculosis of lungs and throat (malignancy?) . . . . .	Negative to Nos. 910, 1,139, 1,171 and 1,081.
5. Uterine hemorrhage (malignancy?) . . . . .	Negative to Nos. 1,086, 1,081, 1,176; operation disclosed a fibroid uterus.
6. Duodenal ulcer confirmed by x-ray; not malignant. . . . .	Negative to Nos. 1,059, 1,152, 1,176 and 1,081.
7. Bleeding tumor of bladder. . . . .	Negative to No. 913.
8. Carcinoma of stomach (autopsy not permitted) . . . . .	Positive to No. 913; negative to Nos. 186, 827, 1,334 and 1,298.

In studying the above results, we find that among the control cases, one case of pregnancy gave a malignancy reaction, one case of elephantiasis gave a slight malignancy reaction, one case of empyema of the thorax gave a distinct malignancy reaction, and one case of tuberculosis of the spine gave a slight malignancy reaction; in all other instances the controls reacted in a negative sense. Serum from malignant cases digested some form of malignant tissue in every instance.

The question still arises as to whether extensive ulceration of the skin which is of benign character will develop ferments able to digest epitheliomatous tissue of epiblastic origin or whether extensive inflammation of the peritoneum or pleura will develop ferments for malignant growths of mesothelial origin. In proof thereof we have the serum of a patient suffering from empyema of the thorax giving a strongly positive reaction to an adenoma of the ovary, also mesothelial in origin. On the other hand, the serum of a patient, probably tuberculous, suffering from pleurisy with effusion, failed to digest growths arising from mesothelial, epiblastic and hypoblastic tissue.

19 West Seventh Street.

## SYMPTOMS OF INSANITY IN INEBRIATES.

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By T. D. CROTHERS, M. D., of Hartford, Conn.

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The physician is often amazed at the degree of premeditation and cunning displayed by persons before the drink craze breaks out. There is apparent good judgment and forethought as to what is coming and attempts are made to regulate the conditions so that they will come out exactly as desired.

In all this there is no apparent insanity, but, on the contrary, a clear, sane conception of events and preparation for them, and yet when these cases are studied carefully there can be no question that these very facts indicate unmistakable mental changes.

When the drink paroxysm comes on all unexpectedly, in some unforeseen state and circumstances, and the victim drinks to great excess, there is evidently some unstable and diseased brain state back of this which has burst out from the application of some exciting causes.

When the paroxysm is anticipated, prepared for, and the surroundings are all made subservient to this end, money is secured, business arrangements are made, what wonder that non-expert observers should call this deliberate vice and wilfulness.

When the histories of many of these cases are studied and compared, these remarkable premeditations are found to be reasoning insanities and conditions of delirium, which are prepared for, encouraged, controlled and directed with a consciousness that they will come and must be provided for.

A typical case is that of a banker, who is a strong temperance advocate and a man of excellent judgment in all matters, and yet he will prepare, for a period of eight or ten days in advance, for the oncoming drink paroxysm. He will display great cunning and become very active in philanthropic and temperance work, arrange his business affairs, make no engagements for a certain period, and no promises of any kind of what he will or will not do. Then suddenly he will disappear, go to a distant city, giving very plausible reasons for his absence. Finally he will return in a week or ten days, very pale, nervous and greatly debilitated. These attacks will occur once or twice a year, and will always be preceded by an unusual display of deliberate reasoning and planning, to conceal and cover up his conduct during this period.

His family and associates realize the approach of these attacks by his unusual positiveness and mental clearness, and good sense

concerning himself and others. After his return and a period of debility, he relapses to his normal state of quiet, uniform, consistent realization of all his duties and obligations.

Another example indicates the same cunning reasoning, together with a certain unusual over-confidence and hopefulness. The person will seek some retired place in a country hotel and drink excessively for three or four days. Then he uses beer and other less harmful drinks and recovers. On recovering he is very remorseful and explains to his intimate friends most ingeniously the reasons why he did this and that.

In each instance the same reasoning insanity both precedes and follows. During the interval he is regarded as a man of exceptionally good judgment and character. Many persons of this type become bolder and less cautious as the attacks increase. The preparations for the drink excess become more and more subtle and cunning, but the attack is more open. His former caution disappears after spirits are used, and real manias break out in most unexpected ways.

The word 'periodic,' describing these cases, refers to the uniformity of the appearance of the drink paroxysm, and this is a very remarkable condition in many persons. The recurrence of the paroxysm is not unfrequently exact, as to time, and shows a distinct cycle that seems to be governed by some very remarkable laws yet to be studied. The term 'dipsomania' seems to be confined to persons who show a marked insanity of thought and conduct preceding and during the paroxysm.

The cases described do not exhibit these symptoms in the degree that they attract attention. Many of the persons of this class apparently exhibit most excellent mental and physical health, and seem to be at their very best in every way. Then suddenly their absence is more or less unexplainable. Their worn and debilitated appearance is the best evidence that something unusual has happened, and their reticence repels any close inquiry.

A few instances have been noted where the person exhibited remarkable judgment to conceal his condition and drinking, and afterwards he explained this as fits and in many instances was unable to recall what he had done, although he seemed not to have any particular unconsciousness, except for an hour or two at a time.

In criminal circles, several very startling examples are noted where previously honest, reasonable people, actively engaged in important work, have become criminal during these drink attacks.

The crimes were mostly of a minor character, referring to swindles and forgeries, and schemes to take advantage without force. In one instance of that kind, it appeared that the patient, after drinking spirits, developed an excessive egomania of his capacity to take advantage and his superior sharpness to influence others.



This dominant thought seemed to develop into unusual secretive-ness, cunning and intrigue. When the drink paroxysm was over, a dim consciousness of what he had done provoked an intense desire to repair the injury. Thus, a man conducting and owning a large sales-stable for horses will, at long intervals, while drinking, become the most expert horse-thief, bringing animals to his stables and secreting them. Later, when the paroxysm is over, he will return the horses with frivolous excuses. In the interval he is a thoroughly honest man and manifests good judgment.

This is a veritable insanity, in which a sudden obsession pervades the mind and carries it along sanely and with apparent good judgment. When the drink paroxysm is open and evident, this is unquestioned, but when it is concealed and covered up with great shrewdness, it is difficult to explain.

An example showing another form of these neuroses was that of a man who, from the time of graduation from college, had drunk to excess three or four times every year. These drink excesses were concealed in some degree and were followed by intense remorse and renewed efforts to overcome them. Finally these attacks developed into intense desire to help others. Suddenly he would leave his business and go down to the slum districts and become very active in assisting others, by talking, preaching, praying, making gifts and suggesting methods of relief. These periods would last from one to two weeks, during which he would be perfectly temperate and urge with great eagerness to have others abstain. Then he would go home, remain in bed a day or two, and go about his business as usual, never going near the scene of his previous evangelistic work. One of the mental symptoms that surprised his friends was his change of name and clothing.

He would return home every two or three days and be greatly elated over the success of the work he was doing. At the end of the paroxysm all this period of exaltation would seem to disappear and with it its memories.

These exalted periods for slum work lasted several years. To his family physician they were distinct manias, but as long as they were harmless and seemed in no way to impair the health of his patient they were regarded as of little moment. There was in this conduct a species of cunning and reasoning. Thus he would not go to the same place twice, but selected a new field and would appear as an evangelist, sometimes as a preacher, and then again as a singer. His preaching was perfectly sensible and clear, and his singing was very attractive, but his name and residence were carefully concealed.

Sometimes he took pains to disguise his face with paints and wore an old wig, to appear as a very old man. On one occasion an intimate friend in a distant city went into a revival meeting and

found him conducting it, disguised as a tramp. The revivalist begged of the friend to conceal his identity and gave most excellent explanations.

Another example is reported by an officer of a Bible Society of a very respectable looking man who comes once or twice a year and begs to be given a field for the sale of Bibles and the distribution of tracts. He is assigned a locality and after a few weeks gives up the position, pays for all the Bibles and tracts he has used, and claims that he is ill and cannot go any further. After an interval he returns and repeats the same thing. He is evidently successful, selling large numbers of Bibles for a brief time, and, as he pays promptly, there is no question.

There is another example of a periodic drinker, whose drink periods have merged into obsessions to help others. There are premeditation, good judgment and reasoning, and symptoms of sanity, but literally he is a drink maniac. Some condition of intense irritation and depression that was formally relieved by the use of spirits takes on another form and shows the same intensity of reasonable acts and conduct, which terminate in a short time.

Another example under the writer's care was that of a very prosperous merchant who had for many years brief attacks of drink excesses at home, lasting only one or two days. In the meantime he was a very strong temperance man and very reliable in business matters. The drink craze died out, and there followed distinct periods of extreme generosity and parsimony. He would suddenly cut down the home and office expenses, and show great anxiety to diminish every possible expense, and refuse to pay any bills that could be delayed, giving as a reason that he was on the verge of bankruptcy. After two or three days of this extreme anxiety to prevent loss, he would become very generous, buy things to give away to his friends and family, trinkets and objects of small value, in a most lavish way. This desire would disappear after two or three days, and then his normal, consistent, sound business judgment would prevail. He did not seem to understand this himself, and when his friends and family remonstrated he would show great doubts of their statements, and seemed to have a confused idea of what had occurred.

These are only a few of some very unexplainable symptoms associated with and following the use of spirits. They are largely unstudied, because of the strange character of the acts that are committed. They are concealed by the physician and friends of the family with but little regard for their true character.

Sometimes a will is presented, showing this very condition of reasoning mania. The fear of family exposure of the inner life of the testator results in a compromise, and the literal maniac goes to his grave without being recognized.

Something like this is seen among drug addicts, where, at intervals, a man becomes a drug-taker for a few weeks, and then suddenly abstains. Often he boasts of this, as showing his superior strength of will. To the physician acquainted with drug-takers there is great scepticism about the free interval, and doubts that it occurs.

An example was that of a physician who had drink attacks without any apparent causes. In the place of these attacks, he would take bromide, chloral and opium, and be under their influence for a week or two, then stop and give no evidence of using any of these drugs for many months. Then he would be found at home, stupid, and this would last a few days or longer before he could resume his normal state. In the meantime he was a very temperate, sensible physician, and gave little or no explanation why he had to take drugs at intervals. He died suddenly from some brain disease, and it was thought that these drug obsessions were premonitory symptoms of his final collapse.

As a rule, the periodic drinker, who drops the use of spirits for drugs, never stops the latter, but in some way, either secretly or openly, continues their use; but along with this there is so much reasoning mania that one can hardly depend on the statement of others, and there is no rule that can be followed that will apply to all persons.

It is safe to assume that in every instance where the drink paroxysm has been preceded by apparently sane recognition of its coming, with preparations not only to conceal, but to make the event complete or limited to the best possible conditions, is a distinct symptom of mania. Business men in the large cities who suddenly go off into some country district, with the excuse that they want a change and relief by hunting and fishing, are in most cases simply giving way to the onset of a drink paroxysm. It will be noted that they take with them persons below their standards of living, and are always anxious to conceal their whereabouts.

An instance was that of the Governor of a state who was intoxicated for several days in a log cabin in the Maine woods. He returned, claiming that he had received great rest and benefit, but his death soon after revealed the fact that this had been his custom for years.

One conclusion which should be impressed upon the reader is that a convulsive use of spirits at intervals during which the person is free and apparently normal, is a very ominous symptom and suggests a breaking-down process that should require the best judgment and skill of the family practitioner to overcome.

The person who consciously or unconsciously drinks at intervals, and explains or fails to explain it afterwards, is far from being



normal, and a study of his mental and physical capacity will show wide variations and many suspicious symptoms.

The careless remark that a man 'only drinks at intervals,' indicates profound ignorance of the real condition. Psychical explosions of nerve energy to the extent of stupor are most ominous in the history of a person. Abnormality, degeneration and oncoming acute disease are heralded by these conditions with certainty.

The family physician should never consider events of this kind of little importance. He should teach and preach to his patrons everywhere the meaning of these danger signals.

## THE INSANE DIATHESIS. REPORT OF CASES.

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Severe hereditary taint plays a rôle in the etiology of many psychoses, often modifies the course and symptoms in a definite direction, and, finally, it very frequently induces definite individual psychoses. Apart from this individual significance for numerous fully developed psychological diseases, however, slight alterations of the personality (upon the basis of the hereditary taint) are often observed, which are not classed as fully developed psychoses, but are simply designated as constitutional psychopathic states.

Esquirol gives us this fine illustration: "An insane man is deprived of advantages which he formerly enjoyed. He is a rich man who has become poor. The idiot, on the contrary, has always been in a state of want and poverty." From this illustration it is easy to understand the difference between these two conditions.

One finds numerous gradations between psychoses with and without dementia on the one side and the normal states on the other. In other words, both groups show mild disease pictures, which stand very close to the normal condition. In the psychoses with dementia are found all intermediate stages from the normal limitations to the mild congenital mental weakness which we designate as high-grade imbecility.

In like manner there exist transitions from the normal states to the psychoses, without mental deterioration. These are the states of the psychopathic constitution. They are thus borderland states between mental health and disease without dementia.

What the writer especially desires to call your attention to in this paper is a group of patients who are not feeble-minded, who psychologically, by the Binet-Simon tests, correspond to the normal standard for their age, and in whom, at different times, certain mental symptoms manifest themselves aside from well-developed psychoses. These, as children, appear frequently to be normal as far as intelligence is concerned, and are even at times considered very bright with plenty of shrewdness and cunning. At times, however, one deals with children who do not do so well in school, and whose progress is much interrupted. They learn very rapidly and just as rapidly forget again. Ethically they are often splendidly endowed. They are considerate of the misfortunes of others and free in expressing sympathy. Closer examination,

however, shows that they are very superficial, that they at times present pronounced psychomotor activity, frequently wander about the streets, and early in life indulge in sexual excesses, and smoke and drink excessively. They frequently commit all sorts of misdemeanors and come into conflict with the law. In this group we find the wayward girl and the incorrigible boy who frequently shock their communities with their early criminal tendencies. Punishment in these cases appears to have but little effect, and those who do not become incarcerated in houses of correction become insane, vagabonds or prostitutes.

In many instances this psychopathic endowment merely manifests itself in ill-defined, partial, or latent imperfections, such as eccentricities, moral insensibility, and unsociableness, which are not consistent with a normal development.

In other cases, well-pronounced psychopathic manifestations as hallucinations, illusions and delusions appear in childhood. The writer knew of a case of a boy, eight years of age, who had distinct delusions of being a noted orchestra leader, and, when presented in a children's clinic, continually went through the movements with a baton with all the skill and dignity of a virtuoso. This was kept up continuously throughout the entire day.

Often the feeling tone of these hereditarily endowed individuals shows many abnormalities, and often they stand in direct opposition to the normal feeling tone. These abnormalities of feeling are most frequently manifested in the sexual field. At times contrary sexual feelings are noted. The consciousness of the morbidity of their sexual life is often wanting in these psychopathically endowed patients even after attaining maturity. Severe depressions and excitations arise periodically. Artistic talents are frequent and the manner of thought is spasmodic and full of contradiction.

Night terrors in children, the writer firmly believes, are all developed upon the basis of a severely psychopathic constitution. Generally, but not always, an external factor is to be taken into consideration, but upon investigation it will be found that in nearly all cases the psychopathic endowment lay at its basis, which was evident before the attack and which still remains after its subsidence.

Worms never cause an attack of night terrors in those of normal endowment, but we frequently hear of such manifestations in children with an underlying psychopathic diathesis, who harbor these parasites. In certain severe cases, besides the attacks of night terrors, attacks of delirium are also found in children, which can always be traced to a decided psychopathic endowment.

Some diatheses assert themselves only at a certain age; hence it is that every age has a certain psychosis to which it is espe-



cially prone. Dementia præcox afflicts those in the adolescent period; paresis attacks healthy persons between the ages of thirty and fifty, and a characteristic dementia with confusion is particularly noted in the aged.

Striking symptoms generally appear in childhood. The course is frequently very capricious and, on the whole, remittent and periodical. As has already been stated, many individuals thus endowed, do not succumb to a fully developed psychosis, but in many this occurs. The periodical insanity characteristic of the manic-depressive psychoses frequently develops in a psychopathically endowed individual, who shows frequent emotional fluctuations, or a paranoia may later develop from delusional fancies, which during childhood often appear only transitorily.

Meyer has pointed out that, in dementia præcox especially, the disease develops only in those individuals who show a long-continued and unhealthy biological adjustment, and who meet their difficulties in an inadequate manner, and he insists on the abnormal make-up of those individuals who later develop this psychosis.

We have observed repeatedly in the manic-depressive psychoses essentially constitutional disorders, due to an inherited psychopathic endowment. Just what sort of organic deficiency is at the basis of this predisposition to these various psychoses, it is not possible to state at the present time. In dementia præcox especially there is much accumulated evidence of developmental defects in the brain; but as to what bearing these have upon the production of the psychoses it is by no means easy to judge.

CASE I.—Male, *aet.* eighteen, admitted December 1st, 1913. One uncle on the mother's side is a heavy drinker; one brother living and reported in normal health; father was married for the third time. Mother of the patient is extremely neurotic. Patient is the oldest child. As a child he was reckless and disobedient. Frequently left home without provocation and was very troublesome at school. Frequently played truant, committed many minor misdemeanors, and at the age of eleven practised sexual intercourse with a younger cousin. Was considered an average pupil, but not of studious habits. Became addicted to alcohol early, and smoked cigarettes excessively before coming of age. Joined the United States Army service, where he frequently got into trouble, as he was noted as a 'dare-devil'. Was arrested on several occasions for assaulting individuals for imaginary complaints, and recently made himself conspicuous and attracted considerable notoriety by appearing on the streets wearing bracelets and a monocle. Even as a boy, was spoken of as one who traveled with a 'rather speedy crowd.'

Patient since in the institution has been fairly well behaved, and upon examination presents no disturbances excepting some delusions of a mild persecutory character. These, however, are not systematized. He believes that he was placed here for spite-work, merely to get him out of the way. His memory is good and he shows no intellectual loss.

He was recently released upon the urgent request of his mother, and just a few days ago we learned that he had again been arrested.

It will be noted in this case that the patient is not intellectually defective, nor has he shown any manifestations of a psychosis, and only when he comes

into conflict with unrestraining environments does he give evidence of his degenerative instability.

CASE II.—Female, *aet.* twenty-two, admitted December 16th, 1913. Father was a pronounced alcoholic, and is supposed to have been intoxicated at the time of the conception of our patient. The wife obtained a divorce on the ground of the husband's habitual intoxication.

Patient as a child was considered bright, but was extremely nervous, and of a highly sensitive make-up. Enjoyed reading highly emotional novels. Was always considered rather distant by her playmates, and generally held herself aloof from them. On account of extreme nervousness, patient was taken out of school when thirteen years of age. At the age of ten she began to show distinct psychopathic manifestations. On one occasion she had pronounced hallucinations of hearing in which a voice told her, "Oh! Can that be my child!" These hallucinations reappeared and extended over many months and then disappeared.

Her present psychosis has for its prominent feature the content of the hallucination which appeared when she was a child. She further has the delusion that a president of a certain railroad is her father and that her real parents are only her foster-parents. This idea originated from the fact that this railroad president was then inspecting the road in his private car near the farm of her parents.

CASE III.—Female, *aet.* twenty-two, admitted October 27th, 1913. Has a pronounced psychopathic history. Even during childhood she presented various compulsory concepts. For example, she was abnormally afraid of darkness, and also greatly frightened when left alone. These abnormal fears appeared almost continuously throughout her child-life until the tenth year of her age, when they subsided and the patient appeared as normal as other children.

Her psychosis was one of a hysterical nature, during which she manifested a distinct phobia that it was impossible for her at times to get her breath. She would rush to the window and respirations would become greatly accelerated. This attack was first brought on after childbirth when she witnessed the resuscitation of her child, which was born asphyxiated. An interesting feature of her case is that she has an aversion for the color blue, which she describes as the color of her child which she saw asphyxiated.

CASE IV.—Male, *aet.* twenty-eight, admitted March 6th, 1914. Grandfathers on both mother's and father's side were chronic drinkers. Patient was reported to have been born normal. When but a child he began to show peevishness and great irritability. As a boy he was rather sentimental and frequently made unreasonable demands upon his parents. Frequently got into trouble for some misdemeanor, and before he was twelve years of age associated with lewd women. At the age of twenty he contracted syphilis. When but seventeen years of age he frequently forged checks and had served eighteen months in the Reformatory.

Patient shows an absolute loss of all shame or regret for his many misdemeanors. Frequently would have sexual intercourse with girls when he was a mere boy. Was known as a 'bully' among the boys and was frequently expelled from school for truancy and misconduct.

CASE V.—Male, *aet.* thirty-two, admitted February 20th, 1912. Has a decidedly neurotic history. Has several aunts who died insane. Father is a very eccentric man and extremely neurotic.

As a child the patient was nervous and generally considered seclusive. Before the writer's professional acquaintance with this patient, he knew him personally as a boy. He was always considered very eccentric, would have fits of abstraction, and held himself above his playmates, thus generally arousing antagonism. He was always of an unsympathetic nature, and at

an early life showed a marked dislike for his mother, whom he accused of being partial to a younger brother.

Was frequently impudent, and seldom did as he was told, if it did not suit his fancy. At school he was dreamy and generally acted in a lofty and superior manner. He was haughty and conceited and had few friends. He was addicted to day-dreaming and pictured himself as some great personality. He had many fantasies. These may occur normally in childhood, but what differentiates these abnormal fantasies from the normal ones of childhood is that they are more lasting, and are not apt to disappear at short intervals. The psychopath relinquishes his fantasy concept very slowly and often at times not at all.

Patient showed, early in life, talent for mechanical drawing, and later pursued this as an occupation. However, he made many failures in his business ventures for himself and met with many reverses. He tried to obtain employment in various cities throughout the country and, although he was considered a genius in his line of work, he was never permanent in his positions. During the psychosis the patient had the delusional idea that he was going to marry the daughter of the President of the United States. In consequence he developed many persecutory ideas because these plans were interfered with.

It will be noted from the statement above that the patient was always very dreamy and egotistical even in childhood, and during the development of the psychosis later in life, the same egotistical ideas became prominent. On psychoanalysis we ascertained that the idea of marrying the President's daughter came as a result of a dream, in which he pictured himself going through a wedding ceremony with her. At this meeting there were many foreign Powers represented. Armor-clad soldiers surrounded the guests, and he heard cheers coming from multitudes of people on the outside.

According to Freud's idea that all dreams are wish-fulfilling, the dream of the patient was emblematic of social position (marrying the President's daughter); strength and power (armored soldiers surrounding the guests); prestige (the presence at the wedding of representatives of other governments).

About six years previous, the patient was engaged to a young woman in rather moderate circumstances and of an extremely unassuming and modest disposition. This engagement was broken off, especially by the influence of the patient's mother, on account of the differences in religious faith, the patient being a Protestant and his fiancée a Catholic. The mother personally made the demand that the engagement ring be returned.

The patient during a period of several months refused to eat meat or animal food of any kind, believing that it contained many impurities. This idea probably originated from the belief that it is right to abstain from meats on a certain day of the week, which is a custom of those of the Catholic faith.

The patient continually boasted and prided himself upon his extreme purity and virtue, and claimed that up to the age of thirty he had never practised coitus. This statement frequently brought ridicule from his fellowmen, which greatly angered him.

The color white was always his favorite color, as it is emblematic of purity and virtue. He formerly enjoyed seeing his sweetheart dressed in white, and during the psychosis this played quite a prominent part. On one occasion, while on furlough, he visited his aunt, who observed that he was fatigued from a long walk of over five miles, and offered him a glass of milk. This caused him to become greatly excited, and apparently without any external cause, he uttered a tirade of abuse so vigorous that the neighbors



rushed in to the rescue of the aunt. It became necessary to return him from the aunt's home to the hospital the same day. The explanation given by him for this unexpected outbreak, on being offered a glass of milk, was that he did not care for milk, because milk, although emblematic of purity (being white), at the same time was an animal product, and the offering of it to him was interpreted as an attempt to entice him to partake of an animal product, to which he had aversion, under the guise of purity.

He at one time made an assault upon his mother, for whom he had a particular dislike, and in applying the association test of Jung the reaction word after ten seconds to the word 'ring' was 'mother'. The mother was particularly instrumental in bringing about the separation of the patient from his sweetheart. She had demanded the return of the engagement ring and had even gone to the priest, requesting him not to perform the marriage ceremony.

After the failure of his plans to marry the President's daughter, his persecutory ideas became greatly intensified, because he believed there was a concerted plot to interfere with his marriage. His ego consciousness also became more prominent.

In this case the dissociation of the personality of the patient was due to a conflict between the unconscious mental processes which were incompatible and out of harmony with the rest of his thoughts; and the symptoms were the products of these underlying unconscious complexes.

Under the guise of modesty and purity there was a strong sexual unrest which the patient attempted to satisfy by excessive masturbation. Further, while he was formerly content to marry an unassuming and quiet country girl, in the psychosis he wanted to marry the daughter of the President of the United States.

It will be noted that both the constitutional psychopathic state, with its milder manifestations, and the pronounced psychosis, with its clearer picture of mental alienation, may be viewed as determined by certain abnormal diatheses, and that when certain demands for adaptation arise the patient is found inadequate to meet them through inherited weakness.

The question for the family physician naturally arises, What can be done for these cases? The following is often a question for him to decide: Can the child in question remain in the family or not? Self-evidently such cases will always be cared for at home at first, but where circumstances in the family are detrimental, and treatment at home not possible, such cases should be placed in the families of relatives or friends or in the families of strangers or competent teachers. There is no public provision for the care of such children, and it is sad indeed to note that they are most frequently left to their fate. They frequently cannot be sent to a hospital for the insane, because they do not present a well-marked psychosis. Even here they do not do well, because they are mischievous and hard to manage and are a detriment to the welfare of the other patients. An institution for the feeble-minded is not a proper place for them, as these children are not weak-minded. Some of them show more than average intelligence. They do not get along in the ordinary school, and special instruction is neces-

sary. Some of them fall behind in their classes and are a hindrance to other children, and, because of their tendency to disobedience, theft and truancy, it is often necessary to expel them from school.

There is a long-felt want of giving such psychopathically endowed individuals the necessary aid and advice which in many cases may abort the psychosis. The entire mode of living must be changed, and especially must there be supervision of all reading matter, as that of fairy tales, novels, and detective stories, the avoidance of theatrical productions, and especially the present-day sensational moving picture entertainments. The family physician can do much in these cases by his timely advice, as he is generally the first one to see them, and by skilfully adjusted occupation and diversion, special individual study and care, and personal suggestion, can obtain most excellent results. Early recognition of these insane diatheses, and the prevention of their deleterious development, is one of the noblest achievements of medicine.

## ON THE EXTRACTION OF NEEDLES FROM TISSUES.

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It falls to the lot of every practitioner to have to deal with needles driven into the tissues by accident, and, since but few have access to x-rays in locating the foreign body, directions for the successful removal of a needle, which are not to be found in the textbooks, may be of some aid. For anesthesia, local infiltration with novocain-suprarenin solution usually suffices, and nitrous oxide gas may be used as well.

In the hand, the needle is usually driven in by the sewing-machine, and, since the eye is at the point, it goes in eye foremost. The significance of this is, that if a thread be carried in with the needle, no attempt should be made to extract the needle by traction on the thread, not only for reasons that are very obvious, but also because the thread forms a valuable guide to the position of the needle.

In the foot, the needle is likewise driven in eye foremost, since it is usually an ordinary sewing-needle that is stuck in the floor. In the third common situation—the buttocks—the same relation exists.

The clinical diagnosis is made by the history, the presence of a punctured wound, abiding pain, and especially by an area of circumscribed induration, and tenderness at some one spot. The last is of the utmost importance in accurately locating the needle, for pressure upon the latter necessarily traumatizes the tissues and markedly increases the tenderness.

The writer's method of finding a needle without a skiagram depends upon the rigid observance of four rules. In the first instance, the field must be *absolutely bloodless*. This is attained by exsanguinating the tissues from the fingers or toes to above the elbow or knee by a Martin rubber bandage. The first turns of the latter are now uncoiled sufficiently so as to expose the operative field; the remaining coils suffice to keep the blood back. The second is to *follow the black track* which leads from the skin puncture to the needle; the success of this step is dependent upon that of the first. The third is *efficient retraction of tissues*. The fourth is to *lose no time in searching through the fat*, since the needle travels directly to deep fascia or bone, the subcutaneous fat being too soft either to stop or break it. The mechanism is, that at the



instant of impact of the needle against the tissues the elastic fat is compressed and the needle is driven into and caught in a strong grip by the dense palmar or plantar fascia or bone, and that when the pressure is released the elastic fat springs back into place and swallows up the needle, as it were.

With the patient properly anesthetized, a free incision is made directly down to the deep fascia. The length of the incision varies directly with the depth of the subcutaneous fat. In some cases time is gained by adding another limb so as to fashion a T-incision, and often even a crucial incision is necessary. The incision is so placed as to include the skin puncture made by the needle, and the black track is exposed and followed to the deep fascia. The latter is thoroughly exposed by retracting the flaps. The needle is usually found sticking into the deep fascia, but if it has penetrated more deeply, this fascia must be incised and retracted. The underlying muscles or tendons are examined each in its own plane.

This method of *plane dissection* is very important. If the needle is not in one plane, it must be in some other, and each plane must be successively explored. The bones form the last plane, and by the time they have been reached, the needle has probably been found. It is carefully extracted by traction *in its own axis*, for it is liable to break. Before each plane is dissected it is palpated with the tip of the little finger, or explored by the handle of the knife, which may scrape against it. These are invaluable methods of detecting the needle.

By following this plan, the usual causes of failure—namely, too small an incision and insufficient retraction, will be eliminated, and, prevailing opinion to the contrary notwithstanding, it is not always essential to have a skiagram for guidance.

# MEDICAL AND SURGICAL PROGRESS.

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## THE CEREBROSPINAL FLUID AS A FACTOR IN SURGERY.

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### A REVIEW OF RECENT LITERATURE.

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By FREDERIC HAGLER, M. D., of St. Louis, and  
M. G. SEELIG, M. D., of the Editorial Staff.

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20. Kramer: Fatal Accidents Following Injection of Antimeningitis Serum. (*New York Med. Journ.*, June 6th, 1914.)
21. Pussep: Autodrainage for Internal Hydrocephalus. (*Revue de Chir.*, December, 1913; ab. *Journ. Amer. Med. Assoc.*, February 21st, 1914.)
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23. Senge: Infectious Meningitis Following Spinal Anesthesia. (*Zeitschr. fuer Geburtsh. und Gynæk.*; abs. *Journ. Amer. Med. Assoc.*, January 3rd, 1914, p. 82.)
24. Weed: Theories of Drainage of Cerebrospinal Fluid. (*Journ. Med. Research*, September, 1914.)
25. Weed: Pathways of Escape From Subarachnoid Spaces With Particular Reference to Arachnoid Villi. (*Journ. Med. Research*, September, 1914.)
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Perhaps no field of medicine, so attractive from an investigative standpoint and so important from the practical clinical side, has remained so long unexplored as has the study of cerebrospinal fluid. Quincke's comparatively recent demonstration of a safe method of tapping the lower spinal meninges led to the investigation of fluid tension, cytological and chemical properties of the fluid, and bacterial invasion; but many other problems quite as fascinating and important were neglected for an inexplicably long time.

The importance of the subject extends to practically every field of the medical sciences; and it meets the planes of the various specialties at so many points that it may be said it does not belong exclusively to any one of them. The unquestioned importance is likely to increase as the intraspinal treatment of cerebrospinal disorders reaches perfection; prominent milestones have already been set up in this direction by Flexner and by Swift and Ellis. With the increasing employment of substances for purpose of spinal anesthesia, interest is further deepened, particularly for surgeons. Indeed, a consideration of the subject is possibly of greater moment to the surgeon than to the worker in any other field, since many cerebrospinal disorders are amenable only to surgical procedures. The hitherto hopelessness of certain conditions combated by other methods seems to demand their inclusion within the scope of the surgeon; and it now lies within the province of surgical research successfully to devise ways and means to overcome the



difficulties brought about by cerebrospinal fluid stasis, whether produced by cerebrospinal anomalies, tumors, infections, or other causes.

The present review is intended as a survey of the more recent literature which refers rather specifically to the rôle of cerebrospinal fluid as a factor in surgical problems; consequently we have refrained from discussing some phases which are both fascinating and important. For convenience only—not for the sake of classification or indicating relative importance—we have chosen to touch upon the questions under several different headings.

So far, it has not been demonstrated that any disease is regularly accompanied by, or that any definite train of symptoms follows a decrease in the quantity of cerebrospinal fluid. An accumulation, however, does very definitely follow certain lesions and produces a fairly well-recognized chain of consecutive symptoms. It is obvious that fluid accumulation may be brought about by any interference with the normal balance between production and absorption. This balance may be overthrown either by an overproduction or by a diminution of the absorptive function, or by disturbances of fluid currents whereby a normal quantity is prevented from reaching areas from which a normal drainage may occur.

*The Production of Cerebrospinal Fluid.*—It appears to be fairly well settled that the cerebrospinal fluid is a product of the cubical cells of the choroid plexuses of the lateral ventricles. The histological evidence that it is produced by a genuinely secretory activity is abundantly supported by experimental data.

Weed presents fairly conclusive proof to show that the perivascular lymph spaces also participate in the formation of the fluid, and he lays special emphasis on this dual source of production. This probably explains the peculiar differences between cerebrospinal fluid on the one hand and either lymph or a typical secretion on the other. This accounts also for the opposing views of those who regard it as a transudate and those who consider it a secretion. Cushing and Goetsch believe that the secretion of the pituitary body passes into the cerebrospinal fluid, and claim to have discovered and demonstrated its presence. Carlson takes issue on this point, objecting both to their experimental methods and their interpretation of results. He and his associates find no evidence of its presence, though Carlson very considerably adds that his failure to confirm the experiments does not conclusively prove Cushing's assumption to be erroneous.

Dixon and Halliburton contribute the very interesting experimental fact that the secretion may be increased by the intravenous injection of certain substances and diminished by others. A practical utilization of this point is not yet apparent. Frazier adds to the theory of secretion by showing that certain agents increase the activity of the choroid plexuses and at the same time markedly lower blood-pressure, this speaking strongly against the older theory of filtration or transudation. Dandy and Blackfan have observed the singular and rather disconcerting fact that formation of fluid goes on after removal of the plexuses. Becht is more inclined to favor the mechanical processes in the formation.

An effective barrier somewhere prevents the passage of medicinal substances from the circulation into the cerebrospinal fluid. Hexamethylenamine, bile pigments, and sodium salicylate are the

only ones so far recovered. This has given experimental support to the method of Swift and Ellis for intraspinal salvarsan medication; but it is neither clear that salvarsan owes its effectiveness to its presence in the cerebrospinal fluid, or that introducing it is a guarantee that it must remain sufficiently long to exert any permanent favorable influence. The efficacy of hexamethylenamine in cerebrospinal infections is questioned on the ground that it is not broken up into formaldehyde in other than acid media. It is true that the reaction of the cerebrospinal fluid is alkaline, but the degree of alkalinity is slight, and many infecting organisms are acid formers. The use as originally proposed by Crowe should not be altogether given up.

The quantity of the normal secretion is a very difficult matter to estimate, since the mere tapping of the subdural space alters the normal tension and probably results in a marked increase. Dandy and Blackfan estimate by testing the rate of absorption that a total new supply is secreted every three or four hours. The huge quantities sometimes observed to escape after basal fractures seems to represent an attempt of the secretory mechanism to keep up the normal tension, and probably is no criterion of the normal rate of production.

*The Circulation of the Fluid.*—From the lateral ventricles the cerebrospinal fluid passes to the third ventricle, thence along the aqueduct of Sylvius to the fourth ventricle. From the fourth ventricle it escapes into the general subarachnoid space, though the portals of its escape are still questioned. The opening between the caudal ventricle and the cisterna magna, first described by Magendie, has been called an artefact by some; others have apparently demonstrated not only its existence but the presence of other foramina as well. The more careful of the recent observers hold it to be the normal channel of communication; likewise the identity of the foramina of Luschka between the lateral recesses of the fourth ventricle and the cisternæ can hardly be controverted.

On reaching the subarachnoid cisternæ about the cerebellum, the fluid either passes caudad in the spaces of the spinal arachnoid or cephalad over the hemispheres and around the basilar structures to constitute the irregular collections and streams in the various enclosures made by the arachnoidal. The connection and correspondence of the spinal and cranial subarachnoid spaces was conclusively demonstrated by Key and Retzius, though there has not existed complete unanimity regarding the physiological correspondence of the two spaces. No current paths have been shown passing directly from the one to the other.

*Drainage of the Fluid.*—These principles are agreed upon: the fluid leaves the spinal and cranial cavities both by the blood and lymphatic streams. Further than this there is agreement only in part. Observations made by the detection of certain dyestuffs and chemicals in the blood and lymphatic channels, after injection into the subarachnoid spaces, lead to the general belief that the absorption of the fluid is a process which takes place diffusely from the whole space, and that the far greater portion of fluid escapes into the venous stream. The lymphatic drainage is evidently comparatively slow and of minor importance, not in any measure compensating for obstruction of venous channels.



The exact mechanism of entrance to venous channels is not clear, but it seems that the Pacchionian bodies are not essential, and the so-called arachnoidal villi with patent stomata probably do not exist. Weed was able, however, to make a direct artificial communication by puncturing through the sinus into the arachnoidal space. Dandy and Blackfan use phenolsulphonephthalein injections, and estimate the rate of absorption from the subarachnoid space by noting the rapidity with which it is excreted into the urine. They show that in certain cases there is a very definite retardation of absorption from the subarachnoid, and that accumulation results from this cause. Knopfmacher contributes some similar observations. The most important point in absorption is that it is a diffuse process, and that either obstructing the venous sinuses or excluding the fluid in any way from any considerable portion of the subarachnoid space results in accumulation of cerebrospinal fluid under increased tension.

*Cerebral Compression.*—It is known that a gradual compression is tolerated beyond an acute one, the intracranial structures accommodating themselves to a considerable increment of gradual pressure. All agree that grave danger lies in sudden deviations, and that both rapid release of pressure and rapid compression are to be avoided. Meltzer recently called attention to the probability of most accidents in the administration of antimeningitis serum being due to the rapid rise of intraspinal and intracranial pressure. The primary cause of death in cerebral compression has recently been inquired into by several investigators. Very contradictory views have been propounded, and there is yet no general agreement as to the precise mechanism. Cushing dissented most vigorously from Horsley's contention that the respiratory centre failed first and that circulatory failure was secondary. Dixon and Halliburton champion Horsley's view, and have recently introduced evidence to substantiate the theory that the respiratory centre is the first to succumb. Clinical observations tend to show also the correctness of this opinion.

*Meningitis.*—The symptoms of meningitis are known to be due to two pathological factors—namely, first, the metabolic action of the particular microorganism on the meninges and the cortex with the production of certain toxins; and, second, the increased intracranial tension. The latter can usually be controlled by repeated puncture, but in spite of this the toxemia proves fatal in many suppurative cases. It has been repeatedly suggested that a free continuous drainage might diminish the toxemia by allowing the bacterial products to be washed away, and to this end numerous and various operations have been devised.

Drainage of the cisterna magna, as proposed by Haynes and Kopetsky, seemed logical and was thought to promise much; Day and the originators themselves, however, report very discouraging mortality figures. Simultaneous tapping of the ventricle and spinal canal with establishment of continuous irrigation seems quite too radical and formidable; and we should hesitate to recommend Ballance's method of directly applying remedial agents to the cerebral cerebrospinal fluid through trephine opening. Leonard Hill and Cushing have done laminectomy for suppurative meningitis and then given up the method, but more recently Barth revives interest by reporting some interesting recoveries. Leigh-



ton, of St. Louis, in a personal communication, reports two successful operations in what appeared to be otherwise very unfavorable cases. While we fail to understand the factors in this operation, which should relieve the toxemia beyond that accomplished by repeated spinal puncture, we are nevertheless, in the light of his experiences, constrained to predict a wider application of this procedure.

It seems apropos in this section to call attention to the report of Senge, who collects 7 cases of suppurative meningitis following spinal injections for anesthesia. Two deaths in the series speak forcefully for the careful observance of a rigid aseptic technique in this manœuvre. Kramer, of Cincinnati, warns against the spinal injection of any serum which is preserved with a phenol derivative; referring particularly to trikresol which is added to many sera, and which, according to Kramer, is a powerful poison to nerve tissues.

*Brain Tumors.*—Frazier has been especially active in investigating the relationships of brain tumor and cerebrospinal fluid. He is authority for the statement that in many, if not in most, tumors the greater portion of compression symptoms are not due to direct pressure of the tumor itself, but to interference with cerebrospinal fluid drainage. In cerebellar and cerebello-pontine angle tumors, the fourth ventricle is compressed so that the fluid cannot escape into the free general subarachnoid space. Or it may be that this portion of the brain is pushed upward against the tentorium, so that while the fluid escapes from the fourth ventricle, it is prevented from reaching the large absorptive field of the subarachnoid about the hemispheres. In either case there is accumulation of fluid with pressure, and often the ventricles are distended, and hydrocephalic symptoms follow. In addition to decompression, Frazier suggests repeated puncture of the corpus collosum, hoping thus to open a permanently patent path directly from the ventricle to the cerebral subarachnoid space. If this can be successfully accomplished, it certainly seems to strike near to the ideal method of treatment.

Much discussion has followed the various explanations for ocular background changes in brain tumor; but now at last there seems a fairly general concurrence in the belief that it is not an inflammatory reaction, and that the essential lesion is an interference with venous return from the eye. The pressure is transmitted along the cerebrospinal fluid in the dural sheath about the optic nerve to the lamina cribrosa, and here the veins are obstructed. The term 'papilloedema' is therefore preferable to the older 'optic neuritis.'

It is interesting in this connection to note the very close analogy which Weed and Wegforth observe in the production and absorption of ocular and cerebrospinal fluids. Glaucoma, they find, is quite comparable to internal hydrocephalus; and they relate some exceedingly interesting experiments both in the artificial production and experimental relief of increased intraocular tension.

*Hydrocephalus.*—Haynes, Dandy and Blackfan, and others have lately contributed splendid articles. Particularly excellent is the article by Dandy and Blackfan which appears in the *American Journal of Diseases of Children*, December, 1914. They undertake a very comprehensive review of the literature, and then add sev-

eral valuable original observations which are model combinations of experimental and clinical studies. They show that both experimentally and clinically hydrocephalus may be of two types: First, one in which there is an obstruction to the outflow from the ventricles, and, second, one resulting from a decreased absorption from the subarachnoid space. They show that fluid is absorbed scarcely at all from the ventricles; that it is rapidly absorbed from the normal subarachnoid space; and much more slowly in certain hydrocephalic conditions. The practical importance of their contribution lies in the possibility of diagnosis of the two forms. In the purely obstructive type, operation would seem to promise relief, for normal absorption may occur when the fluid is conducted from ventricle to subarachnoid. In the type due to delayed absorption the outlook seems less hopeful.

Operation in this class of cases has uniformly failed because the fluid must be conducted to other absorptive fields. Various schemes have been proposed and elaborate methods devised for conveying the fluid to the subtemporal and subcutaneous regions. Temporary relief follows, but an edema soon surrounds the new path, a new cavity lined with endothelium is formed, and absorption ceases. Pussep alone is encouraged by his results, and he reports ten clinical improvements after fourteen operations for draining the lateral ventricles with a canula which led outside the dura. It is possible that his improvements were all in hydrocephalus of the obstructive type, and that he established a new channel between ventricle and cerebral subarachnoid. To insure permanent absorption, Cushing, Heile and others have attempted to conduct the fluid from the subarachnoid space to peritoneal cavity or pleura. No successes have crowned these efforts, however. Haynes proposes connecting the cisterna magna directly with the longitudinal sinus, and in the light of Dandy's paper his suggestion seems the only one of possible permanent value in the cases of hydrocephalus due to a diminution of absorption from cerebrospinal subarachnoid spaces.

Further attempts in this direction should be encouraged.

## PETROLEUM OIL IN THE TREATMENT OF CHRONIC CONSTIPATION.

## A REVIEW OF RECENT LITERATURE.

By JEROME E. COOK, M. D., of the Editorial Staff.

1. Randolph (*Therap. Gazette*, 1885, Vol. IX, p. 732).
2. Dunbar (*Deutsch. med. Wochenschr.*, 1896, No. 3).
3. Stubenrath (*Muench. med. Wochenschr.*, 1897, No. 24).
4. Hutchinson (*British Med. Journ.*, 1899, p. 724).
5. Schmidt (*Muench. med. Wochenschr.*, 1905).
6. Lane (*British Med. Journ.*, 1913, II).
7. Lane (*Surg., Gynec. and Obstet.*, 1913, p. 600).
8. Tyrode (*Boston Med. and Surg. Journ.*, 1910).
9. Manquat (*Bull. de l'Acad. de Méd.*, 1914, No. 4).
10. *Journ. Amer. Med. Assoc.*, May 30th, 1914, p. 1740.

The prominence which the petroleum treatment of constipation has recently assumed has suggested that a brief résumé of the subject might be both timely and instructive. The pharmaceutical houses are putting on the market various 'elegant' preparations of the liquid petroleum, and the layman has already learned that the 'Russian oil' which may be had at the corner drug store for so much per ounce is 'good for constipation.' Yet this is no new remedy, as its use antedates the present vogue many years.

It was in 1885 that Randolph first called attention to the subject, and his observations are so interesting and withal so accurate that it seems worth while to quote them here. "This substance," he says, referring to petroleum, "while non-saponifiable and chemically distinct from the fats, presents many points of physical resemblance. Prompted by this resemblance, the query arose in my mind a few months ago as to the possible absorption of this soft hydrocarbon by the human digestive tract, and its subsequent oxidation in the tissues;—in other words, whether it could or could not be used as a food. On each of eight days I swallowed half an ounce of commercial vaseline and caused my laboratory assistant to do the same. Digestion was not disturbed in either case, and no noticeable effects ensued. Later, to each of two healthy adults, there was given, in the course of forty-eight hours, one ounce of vaseline. Their feces for three days from the beginning of this experiment were collected, dried and extracted with petroleum ether. From the extract the vaseline ingested was entirely recovered, evidence of its complete rejection by the intestinal surface. In further experiments upon various acquaintances, I have found that petrolatum, administered internally, is often



sufficient to check rather severe diarrheas of irritation, apparently acting simply as a mechanical lubricant, which exerts its soothing effect upon the entire irritated surface. It is a curious fact that petrolatum is also efficient in removing constipation, its action being, of course, that of an unabsorbable diluent of the intestinal contents. The amount requisite to produce the desired result is in this case, however, too large to render the method one of any general usefulness."

The non-absorbability of petrolatum thus established by Randolph was probably not the prevailing view at that time, nor for some years thereafter, for it is during this period that the substance acquired some prominence as a substitute for and in the hypothecation of butter and the other food fats. In 1896, Dunbar, of Hamburg, published an extensive article "Concerning the Toxicity of Paraffin Substances Which at Present Are Being Extensively Used in Bakery Products," in which he concludes that some of these petroleum oils have given rise to distinct toxic symptoms. It is probable that the methods of preparation of these products were not perfected, or at least not uniform, for the toxic symptoms were seen in only a small percentage of the numerous individuals who used them. Furthermore, Stubenrath, the next year, published the results of his animal experiments with different petroleum products. He employed for this purpose the white and yellow American vaseline (Chesebrough), German yellow vaseline, the paraffinum liquidum of the 2nd and 3rd German Pharmacopeia, etc., without being able to demonstrate any ill effects whatsoever. He recommended, however, that an inquiry be conducted into the process of refinement of these products to ascertain possible poisonous contamination.

The present-day use of paraffin oil dates from the publication of Schmidt in 1905. Finding that mechanical factors could not be made to account for all cases of constipation, he arrived, through his researches, at the conclusion that in some individuals digestion is too good, if such an expression may be allowed. That is, there is too little residue, and too little of the putrefactive bacterial action to stimulate intestinal peristalsis. A diet from which one would expect, in a normal individual, a certain fecal residue, would in these patients produce a much smaller amount. That this over-digestion is the cause and not the result of the constipation Schmidt was able to demonstrate by giving normal individuals opium and producing constipation in this way. But it was found that in these normal individuals only the water content of the stool was diminished by this procedure, the solid portions being in the usual amount. In view of these facts, Schmidt sought for some harmless substance which would pass through the gastro-intestinal tract without absorption and which would therefore give the necessary bulk to the stool and furnish the required stimulus to peristalsis. He found two things which would answer these requirements in a satisfactory manner—agar-agar and liquid paraffin. Of these, the former first came into rather general use, due in no small part, it would seem, to its vigorous exploitation as an ethical proprietary in combination with cascara.

Somewhat later the subject of chronic constipation was brought to our notice more forcibly through the writings of Metchnikoff

and Lane with their co-workers and adherents. Both these authors attribute a great variety of bodily ills to the absorption of poisonous substances generated within the intestinal canal. But while Metchnikoff assigns to the colon the principal rôle in this auto-intoxication, Lane believes that the absorption taking place in the small intestine is probably, in the majority of cases, the more important factor. It is not within the scope of this review to detail the many and diverse lesions and symptoms to which, according to these authors, this chronic intestinal auto-intoxication may give rise. The literature on the subject has become quite extensive.

Although, as stated, Lane believes that most of the toxic intestinal substances are absorbed in the small bowel, he yet places the primary cause of the trouble in the colon. It is here that the first stasis occurs and the added weight of the colon due to its chronically overloaded condition causes it to sag, to pull upon its mesenteric attachments, and to produce thereby, instead of the gradual and rounded loops in the winding of the normal gut, sharp kinks and turns. These kinks, representing points of traction, are after a while accentuated by thickening of the mesentery at these points, produced by the same traction. Now, according to Lane, the proper thing in such cases is not to feed the patient with laxatives, buttermilk, large quantities of water, etc., etc. Little good can be thus accomplished. Much more can be done along these lines by giving the patient liquid paraffin. This substance keeps the stools soft, allows them to pass more readily through the angulations of the bowel, and outside of surgical measures offers the greatest amount of relief in such cases.

Much has been said about the quality of the paraffin oil which should be used. It would seem that certain properties may be regarded as essential. Thus it should be colorless, odorless, and as nearly free from petroleum taste as possible. It should be non-fluorescent, free from acids, alkalies and other organic impurities. It appears that the Russian petroleum can more easily be made to conform to these requirements, but it seems certain that the American product, which contains hydrocarbons of a different series, can likewise fulfil all the desired requirements.

The question of dosage deserves a word. Since the oil is given on the theory that its main function consists in keeping the stools soft and, at the same time, increasing their bulk, it is reasonable to suppose that the oil should be given in fairly large doses. The general practice is to give  $\frac{1}{2}$  to 1 oz. two or three times a day. But the literature is particularly silent on this point, so that the necessary or optimum dosage is still a matter of individual experience and preference.

As yet, no extensive reports of a broadly objective stamp have been made concerning the clinical value of the oil in constipation. Just how wide a use it will find and just how completely it will replace the older methods in the treatment of chronic constipation can only be answered by further experience. It is particularly necessary to know whether, after continued use of the oil over long periods, any untoward effects are produced. The crude oil contains toxic substances—those volatile bodies which go to make up coal oil and similar products. It seems proper to inquire as to

whether these are so completely removed as to make the use of the oil over indefinite periods harmless. Again, most remedies for constipation gradually lose their efficacy when persistently used. No statement as to whether or not this is true with petroleum oil has been met with. It is therefore very desirable that clinicians give heed to these points before a proper estimate of the relative value of this remedy can be made.



## DIAGNOSTIC AND THERAPEUTIC NOTES.

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PAROXYSMAL TACHYCARDIA.—Godlewski (*La Presse Méd.*, 1914, No. 79). Paroxysmal tachycardia is ordinarily considered a relatively harmless affection, but if the heart is allowed to beat away for long periods of time, marked prostration may result. The writer reports 2 cases in which the attacks came on after a long day's march on a hot day. The men complained of great precordial discomfort; the pulse was 140 and very small. Each man was given a chunk of bread, the size of a large nut, and was instructed to swallow it whole. Immediately after doing so, the attack ceased and the men felt quite comfortable, the pulse becoming slow and regular. The writer believes that the bolus, as it passed down the esophagus, stretched the latter and so stimulated the vagus. The method, if somewhat heroic, appears worth trying.

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POSTURAL TREATMENT OF ACUTE GASTRIC DILATATION.—Linke (*Beitr. zur klin. Chir.*, Vol. 93, No. 2). Linke reports 3 cases of acute gastric dilatation, of which 2 died. In the case which recovered, relief followed almost immediately upon placing the patient face downward. He states that this postural treatment of the disorder should never be neglected and will serve to reduce the present distressingly high mortality.

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FURUNCULOSIS.—Schuele (*Deutsch. med. Wochenschr.*, 1914, No. 48). Every furuncle may be aborted within the first forty-eight hours if it is burnt out under novocain anesthesia. A 2 per cent. solution of novocain is injected first into the skin, so as to form a wheal, then perpendicularly into the middle of the furuncle. The point of a Paquelin cautery (or a knitting needle heated to redness in an alcohol lamp) is then thrust into the centre of the boil.

A spread of the infection may be obviated by cleaning the skin with soap and alcohol and touching suspicious looking pustules with tincture of iodine.

Even if the boil is ripe, cauterization is to be preferred to incision. The outflow of pus is prompt and the resulting hyperemia furthurs the healing.

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TREATMENT OF ULCUS CORNEÆ SERPENS.—Kuemmel (*Muench. med. Wochenschr.*, 1914, No. 24). Axenfeld and Uhthoff have shown that nearly all cases of ulcer corneæ serpens are due to a pneumococcus infection. According to Morgenrath, ethylhydrocuprein (Optochin), a derivative of quinine, has a remarkable bactericidal power for pneumococci. The drug has been used locally

in corneal ulcer with most successful results. Most pneumococci are killed by a 1 per cent. solution, and this degree of concentration does not injure the cornea. Certain strains of the pneumococcus are more resistant and require concentrations that may cause corneal necrosis. The following mode of treatment is therefore advisable.

Anesthetize the cornea by means of cocaine. Cauterize the ulcer itself by means of a 2 per cent. solution of ethylhydrocuprein. Instill a 1 per cent. solution hourly into the conjunctival sac. Prompt healing is the rule.

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THE PUPILLARY REACTION.—Sarbó (*Neurol. Zentralbl.*, 1914, No. 6). The usual methods of testing the pupillary reflex are subject to various sources of error. The following method avoids most of them. The patient sits or stands not quite facing the light. He raises his eyes toward the ceiling and closes the lids tightly. After a few seconds he opens them and looks into the distance, without converging the eyes. If the reaction is normal, the pupils first contract and then widen. A sluggish reaction is characterized by a barely perceptible initial contraction, the relaxation occurring almost immediately. With rigid pupils, the iris does not move. The test should be made in this manner for each eye separately and for both together.

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THE DIAGNOSIS OF GASTRIC ULCER.—Boas (*Deutsch. med. Wochenschr.*, 1914, No. 23). In duodenal ulcer the stomach contents are free from blood, but contain the latter if duodenal contents are drawn into the stomach by means of an oil test meal. In gastric ulcer, on the other hand, the stomach contents may contain no blood, even though the latter is found in the stool. None of the usual symptoms, Movnihan's hunger-pain, recurrent hyperchlorhydria or periodicity of the attacks are pathognomonic for ulcer. In the presence of an active ulcer, the stools always contain occult blood. This may, however, be present in such small quantities that it cannot be made out by any method except Boas' phenolphthalein test. A positive phenolphthalein test, on the other hand, is not significant unless the patient has been on a meat-free diet for twelve days.

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TREATMENT OF TUBERCULOUS CERVICAL ADENITIS.—Chadwick, Hawes (*Boston Med. and Surg. Journ.*, 1915, No. 1). Tuberculous cervical adenitis in children is almost invariably associated with tuberculous bronchial glands. The treatment adopted at Westfield consists, besides the usual hygienic regimen, in the use of BE tuberculin, if there is no evidence of active pulmonary involvement. Chadwick begins with one-millionth of a milligram and slowly, in the course of about six months, increases the dose up to 10 mgrm. Every effort is made to avoid reactions, and better results are obtained from these small doses than from larger ones.

The result of treatment in these children is very satisfactory. The cervical glands decrease perceptibly in size; and the area of

dullness over the hilus becomes smaller and less pronounced. The longer the tuberculous disease has existed in a gland the slower will be the effect of treatment. Resolution must necessarily be limited if fibroid changes have taken place. Suppuration has not occurred in any case in which it did not exist prior to treatment. This experience leads Chadwick to the conclusion that surgical interference is only necessary to remove such glands as have become caseous or fibroid. Extensive dissections are unnecessary in these cases, as the small recently diseased glands that are left will disappear under the influence of tuberculin treatment.

Hawes admits the occasional value of surgery in such cases, but also advocates the use of tuberculin. He lays most stress upon buccal hygiene, especially the treatment of carious teeth and the removal of diseased tonsils and adenoids.

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GLYCERINE IN BROMIDROSIS.—Benians (*Lancet*, December 5th, 1914). The author finds that the application of glycerine, well spread over the soles and toes before the socks are put on, acts as an efficient preventive of bromidrosis. He used it successfully in 2 cases, boys of fourteen, in whom the trouble had persisted for several months in spite of efforts to insure cleanliness, and in spite of the continued application of drying and antiseptic powders. The glycerine acts, he thinks, by preventing the formation of noxious products (indol, etc.) by the bacteria of the feet, and by substituting an acid for an alkaline medium in contact with the skin of the foot. He suggests its use in the army as a means of keeping the skin soft and supple.

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A DIAGNOSTIC POINT IN APPENDICITIS.—Horn (*Berl. klin. Wochenschr.*, 1914, No. 52). In the presence of an inflamed appendix, traction upon the right spermatic cord will elicit pain in the cecal region. If the inflammation is severe, the pain may also follow a pull on the left cord. The sign is said to be uniformly present early in the disease.

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PALPATING THE KIDNEY.—Pope (*Kentucky Med. Journ.*, 1914, No. 2). The patient stands in front of the examiner, who is seated on a chair. If the right kidney is to be palpated, the examiner's right hand or fist is placed on the right rectus and sufficient pressure made to overcome any rigidity. The patient is then instructed to lean forward over the right shoulder of the examiner and the tissues between the abdominal wall and the back are grasped between the thumb and fingers of the left hand. By assuming the standing and forward bending position, the kidney moves or descends downward and forward toward the abdominal wall. In this position it is more easily accessible to the examining fingers. The thumb and finger gently grasp the kidney between them and are thus enabled to detect whether the kidney is movable or not, and the extent or degree of movability. In examining the left kidney the process is reversed.



## BOOK REVIEWS.

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**CHILD TRAINING AS AN EXACT SCIENCE.** A Treatise Based upon the Principles of Modern Psychology, Normal and Abnormal. By George W. Jacoby, M. D., Fellow of the New York Academy of Medicine, etc. etc. With Illustrations. New York: Funk and Wagnalls Company. 1914. Price, \$1.50.

This book really fills a long felt want. Child training has become, and properly so, a subject of careful study in these days. In this book, Dr. Jacoby, who speaks with the authority of vast experience and exact observation, has laid down the fundamental principles underlying a scientific study of a difficult subject.

After an historical review, the psychology of childhood is carefully considered, with special reference to physiologic development.

The psychic defects of childhood are next taken up, with due emphasis on organic defects as well as functional disorders.

Part IV concerns itself with prophylactic training of the parents and of the children.

Part V is devoted to therapeutics, and these chapters will appeal to everyone interested in the subject at all.

Dr. Jacoby writes in a clear, incisive style, and his book, embodying the results of his careful study, will surely be widely read and greatly appreciated. Roentgen reports would be welcomed, and therefore this book is recommended to many roentgenologists who may feel that their work is far superior to the illustrations in this book.

**THE OCCUPATIONAL DISEASES.** Their Causation, Symptoms, Treatment and Prevention. By W. Gilman Thompson, M. D., Professor of Medicine, Cornell University Medical College in New York City, etc. etc. Illustrated. New York and London: D. Appleton and Company. 1914. Price, \$6.00.

Many valuable monographs have been published in recent years in this country on various general and special phases of occupational diseases. Yet, in the memorial sent to the President of the United States in June, 1910, by the First National Congress on Industrial Diseases, the statement is made that "practically all the standard works of reference on occupational diseases are by English or Continental authorities. There is no modern treatise on the subject by an American authority on industrial hygiene."

This lack has been supplied by the present work. It is a mine of information, though not as exhaustive as some of the corresponding German textbooks. On the other hand, it is based on American experience and statistics, which makes it more immediately useful to the audience to which it is addressed.

**MANUAL OF THE DISEASES OF THE EYE.** For Students and General Practitioners. By Charles H. May, M. D., Chief of Clinic and Instructor in Ophthalmology, College of Physicians and Surgeons, Medical Department, Columbia University, New York, 1890-1903, etc. etc. Eighth Edition, Revised. With 377 Original Illustrations, Including 22 Plates, With 71 Colored Figures. New York: William Wood and Company. 1914. Price, \$2.00.

Extended comment on May's well-known manual would be superfluous. The esteem in which it is held is evidenced by the fact that it has passed through eight editions and has been translated into German, French, Italian, Spanish, Dutch and Japanese.

This (eighth) edition differs only slightly from its immediate predecessor. The text has been subjected to careful scrutiny and both text and illustrations have been improved wherever possible.

**BLOOD-PRESSURE—ITS CLINICAL APPLICATIONS.** By George William Norris, A. B., M. D., Assistant Professor of Medicine in the University of Pennsylvania, etc. etc. Illustrated with 98 Engravings and 1 Colored Plate. Philadelphia: Lea and Febiger. 1914. Price, \$3.00.

Norris's book on blood-pressure meets a definite need. All other works on this subject, in the English language, either cover only a portion of the field or are already hopelessly out of date. The text consists of a well-digested compilation of everything significant that has appeared on the subject, and if the personal note is somewhat lacking, that is perhaps inevitable under the circumstances. It is to be regretted that the author did not lay more stress upon the diagnostic value of the diastolic as contrasted with the systolic pressure, a point that has yet to find adequate recognition.

# SUPPLEMENT

ON

# ROENTGENOLOGY

(ISSUED QUARTERLY)

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Vol. I

MARCH, 1915

No. 1

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## INTRODUCTORY.

The increased usefulness of the Roentgen ray is evidenced by the widespread distribution of Roentgen apparatus not only in the hands of trained roentgenologists, but also in the offices of physicians who pursue a general surgical and medical practice. There is a growing demand for practical information on the operation of Roentgen apparatus and the interpretation of roentgenograms.

The specialist in roentgenology probably finds that contact with his colleagues through membership in the American Roentgen Ray Society and its official organ, the *American Journal of Roentgenology*, provides ample opportunity for keeping abreast of Roentgen progress.

The physician who operates Roentgen apparatus for his own benefit and, possibly on not quite so elaborate a scale as the specialist, desires intimate and practical information on essential Roentgen subjects. He probably finds that the special journals deal with subject-matter beyond the capacities of his apparatus, or that the temper of the articles presupposes an experience in roentgenology which he has been unable to acquire owing to the exigencies of his general practice. In other words, the physician finds that instead of information on a differential diagnosis between a diploic and pneumatic mastoid, he wants practical papers upon fractures, foreign bodies, photographic development, standard radiographic positions, measurement of Roentgen dosage, the care of tubes, practical interpretative knowledge, etc.

The Roentgen Supplement of the INTERSTATE MEDICAL JOURNAL will attempt to provide practical information which will be available to the physician who wishes to increase the usefulness of his Roentgen apparatus. The Editors of this Department will constantly uphold the ambitions and ideals of the American Roentgen Ray Society in maintaining that the refinements of roentgenologic practice demand an apprenticeship and experience beyond the capacities of any physician who does not follow the Roentgen specialty exclusively.

The personnel of the Editorial Board is sufficient guaranty of the standards which this Roentgen Supplement will maintain. An introduction to each one of them may be pertinent.

Dr. A. Howard Pirie conducts the X-Ray Department of the Royal Victoria Hospital at Montreal. His laboratory at the Royal Victoria Hospital serves for teaching the students at McGill University. His Roentgen training at St. Bartholomew's Hospital in London followed his graduation from Edinburgh University. He was called to McGill University in 1911, where he is at present Lecturer



on Radiology. His literary contributions have been numerous and always of great practical value.

Dr. George F. Pfahler, of Philadelphia, is an ex-president of both the American Roentgen Ray Society and the American Electro-Therapeutical Association. He is Professor of Roentgenology at the Medico-Chirurgical College, Philadelphia, and Director of the Roentgen Laboratory of the Medico-Chirurgical Hospital. His research work has always been of great usefulness and his contributions frequently opened up new fields of Roentgen work in America.

Dr. James T. Case is Roentgenologist and Assistant Surgeon to the Battle Creek Sanitarium where he has had unusual opportunities to develop gastro-intestinal Roentgen technique. He is Roentgenologist to St. Luke's Hospital and Consulting Roentgenologist to the Cook County Hospital, Chicago, and is Professor of Roentgenology in Northwestern University Medical School.

Dr. Russell D. Carman is Chief of the Roentgen Laboratory, Mayo Clinic and St. Mary's Hospital, Rochester, Minn. Previous to this work he was Instructor in Roentgenology, Medical Department, Washington University, St. Louis.

Dr. Sidney Lange, of Cincinnati, is Lecturer on Radiology, University of Cincinnati; Roentgenologist to the Cincinnati General Hospital.

Dr. Eugene W. Caldwell, of New York, has an international reputation and is an authority upon radiographic technique. He was president of the American Roentgen Ray Society, 1907-1908. Author of an early standard textbook upon roentgenology.

Dr. George C. Johnston, of Pittsburgh, is an ex-president of the American Roentgen Ray Society and is Professor of Roentgenology at the University of Pittsburgh. He is Roentgenologist to the Alleghany General Hospital and several other hospitals in Pittsburgh.

Dr. Arthur F. Holding, of New York, is Roentgenologist to Cornell University Medical College, Cancer Research Department, and is Professor of Roentgentherapy, New York School of Roentgenology. He is Chief of the Roentgen Clinic, Cornell University Medical College, New York.

Dr. Arial W. George, of Boston, is Roentgenologist to the Mt. Sinai Hospital and the Good Samaritan Hospital and Consultant Roentgenologist to the Carney Hospital. He is the author of numerous books on various roentgenological subjects.

Dr. Hollis E. Potter, of Chicago, has been the Director of the Roentgen Laboratory at the Presbyterian Hospital, and Instructor in Roentgenology at the Rush Medical College for the past four years. He is one of the editors of the department of radiology of the International Abstract in Surgery (*Surgery, Gynecology and Obstetrics*).

E. H. S.

## FOREIGN ROENTGEN JOURNALS.

The European war has hindered the publication of foreign Roentgen journals considerably.

Up to the present time the English publications have not suspended. The *Archives of the Roentgen Ray* arrives regularly and on time. The *Journal of the Roentgen Society* has not failed to appear as usual and its scientific atmosphere would not indicate that Zeppelins were hovering about. The *Archives of the Roentgen Ray* presents much reading matter indicative of strife. There are roentgenograms of injuries caused by bullets and articles showing simple and rapid Roentgen methods for the localization of bullets.

None of the French Roentgen or electrical journals have appeared since July, 1914. From authentic sources we learn that the *Archives d'électricité* suspended after the issue of July 25th, 1914. This is one of the oldest electric-therapeutical journals and was in its twenty-second year. The new French Roentgen journal—*Journal de radiologie*—suspended with the July issue, No. 7. This publication started off with great promise and compared favorably with the *Fortschritte*. Its illustrations by Marmard were wonderful in detail. The *Bulletins et mémoires de la Société de radiologie de France* has failed to appear since the June issue.

The German publications seem to have fared well. The *Fortschritte auf dem Gebiete der Roentgenstrahlen*, Band XXII, Heft. 3, bears the date of July 3rd, 1914, and Heft 4 appeared October 20th, 1914. There is little indication of the influence of the war in the last issue, as the abstracts of its leading articles in our Roentgen Supplement show.

The *Zentralblatt fuer Roentgenstrahlen, Radium und Verwandte Gebiete* has appeared regularly up to and including the October issue. The last issue arrived in America three months late, probably on account of irregular ocean freight service. Importing book firms, as a rule, have a central European collecting station from which shipments come by freight. The journals are only mailed after their arrival in America. The *Zeitschrift fuer Roentgenkunde* suspended publication after the completion of the volume for 1913, which suspension cannot be attributed to the war. *Strahlentherapie* has not appeared since August 1st, 1914.

The Belgian *Journal de radiologie* has not appeared since the middle of the year 1914.

The Roentgen book activity seems to be centered in America. There is every indication that the next two years will witness the publication of many Roentgen textbooks which will establish American roentgenology in a most concrete manner.

Nothing new in books seems to be forthcoming from France or England. There has been an announcement of a new two-volume work upon "Die Roentgendiagnostik in der Inneren Medizin" by Groedel. This is probably a new edition, with additions, to Groedel's one-volume "Atlas" published in 1909.

It seems that European strife makes American opportunity, but it seems a pity that a war of nations should interfere with the progress of science and civilization. When we look back upon the enviable character of the Roentgen lore which has emanated from Vienna and realize that at the present time these roentgenologists are at the front or attending the wounded in base hospitals, we cannot but stand aghast before the awfulness of war. All research work in the European countries is absolutely at a standstill.

Will America be able to take up the Roentgen standard and carry it forward, or shall there be a temporary halt?

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DR. DEANE BUTCHER.

The editorial management of the *Archives of the Roentgen Ray* passes into the hands of Dr. Robert Knox, Dr. Cumberbatch and Mr. Russ with the January, 1914, issue. The illness of Dr. Deane Butcher, who has outlined the career of the *Archives* for many years, forces the change. There will be no change in character or policy of this representative British journal.



## THE POST-OPERATIVE ROENTGEN TREATMENT OF CARCINOMA OF THE BREAST.

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By H. W. DACHTLER, of Toledo, Ohio,Roentgenologist to St. Vincent's, Flower and Lucas County Hospitals, Toledo.

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The writer's experience during the past eight years with the post-operative *x*-ray treatment of carcinoma of the breast has not only been encouraging in results but in the increased co-operation of surgeons referring such cases. The co-operation of the surgeon is of the utmost importance.

In the case reports herewith given, private cases only have been considered, for the reason that such patients can be traced and the ultimate results obtained in a more accurate manner than is the case with hospital charity cases.

When we review the favorable results of our early post-operative treatment and the great improvements which have been made in tubes and in the technique of *x*-ray therapy, it seems that this adjunct to the surgical treatment is indicated in all operable cases of mammary cancer. About eight years ago favorable reports on the post-operative treatment of carcinoma of the breast as well as the remarkable results obtained in inoperable cancer recurrences began to multiply in the medical literature. These contributions, as well as my own favorable results in the *x*-ray treatment of superficial epithelioma, led some of my surgeon friends to adopt the post-operative roentgenization of cases of mammary carcinoma. On investigating the subject, the writer found there were conflicting opinions. Some roentgenologists were reporting good results, while some surgeons who had given the method a trial reported that they had discontinued its use. To determine as near as possible the status of the method, the writer in 1906 visited many of the leading *x*-ray laboratories to study the technique employed and the results obtained. The opinions of surgeons, who were referring or who had been referring their cases of carcinoma of the breast for post-operative *x*-ray treatment, were also secured. Some surgeons reported that recurrences had been observed as frequently after roentgenization as before its adoption and therefore that as a post-operative treatment it had been abandoned. Whenever unfavorable opinions were given, almost invariably on investigation faulty methods in technique were discovered. As a rule there was not a hearty co-operation between the surgeon and the roentgenologist, the roentgenologist stating that usually only a short series

of treatments was given while the patients were in the hospital. After returning home they either did not come for treatment or they returned at irregular periods. On the other hand, in some places where the surgeon would have given the method a fair trial, the facilities for Roentgen treatment were sadly inefficient. In some hospitals the work was in charge of internes, who often had not mastered the first principles of roentgentherapy. In other places the protection offered the *x*-ray operators was so meagre that they could not be expected to push the work under conditions which meant grave danger to themselves. In one celebrated institution of learning patients were sent to the *x*-ray department (which was in charge of inexperienced internes) with a prescription calling for so many minutes of *x*-ray treatment. Absolutely no method for measurement of dosage was known or attempted. In one large charity hospital, where many cancer patients were treated, post-operative *x*-ray treatments were given only while the patients remained in the hospital.

Unfortunately, many surgeons still base their opinions and criticisms of post-operative Roentgen therapy upon the results obtained under such unfavorable conditions. Where the writer found encouraging results, the technique of that particular roentgenologist was carefully studied.

The writer wishes here to express his deep appreciation of the work being done at that time by Dr. Geo. E. Pfahler, of Philadelphia, to whom he owes much for the inspiration and encouragement which enabled him to carry on the work in this field.

After returning from this tour of inspection, the writer was convinced that a hearty co-operation of the surgeon was the first requisite for successful results in the post-operative *x*-ray therapy. The surgeon must first impress upon the patient the value of and the necessity for such treatment. He must not leave the patient with the opinion that all had been done that could be done when the operation was completed. The surgeons who have since referred such cases to the writer have always insisted that the operation should be followed immediately by the *x*-ray treatment. Only in this way, the patients were informed, could they feel assured that they were obtaining the best that medical science could offer at that time for the cure of their condition.

In order to give the method a fair trial, *x*-ray apparatus was installed at St. Vincent's and Toledo Hospitals to carry on the work.

From the outset no patient was treated without a thorough understanding of the time necessary for the treatments to be continued and no patient was treated who could not make arrangements to continue them after leaving the hospital. Every effort was made to avoid having patients discontinue treatment before

a full course had been given. The financial part was also arranged with that object in view. We did not wish to have patients who had been insufficiently treated unfavorably influencing public or professional opinion.

Whenever possible, treatment was commenced on the second day after operation. Treatments during the operation were entirely abandoned, for it seemed unwise to prolong the operation. One of the chief effects of post-operative Roentgen therapy is the obliteration of the remaining lymphatics and lymphatic glands. If a proper technique for deep  $x$ -ray therapy is used, the treatment is just as effective after the skin has been closed. There is no advantage to be gained by roentgenization with secondary skin closure.

In the writer's early cases the treatment was continued daily for two weeks, the patients remaining in the hospital during that period. The treatments averaged twenty milliamperè minutes with an anode distance of 12 in.; a leather filter as recommended by Pfahler was used. The patient was then allowed to return home for two weeks, which was usually a sufficient length of time for the skin reaction to subside. From observing the intensity of the reaction obtained, the frequency and dosage of further treatments were determined. Subsequent treatments were usually given every other day until from thirty to forty treatments were given. The average number of treatments was thirty-five. A deep tanning of the skin was produced and maintained until the end of the treatment. If too severe a reaction occurred, the treatment was discontinued for one or two weeks.

The marked skin reaction produced may not have been absolutely necessary, but experience has shown the writer that it is harmless and that it is at the same time the best indication that the treatment is being carried as far as possible within the limits of safety. The writer has never recommended, nor does he think it advisable for a patient to take subsequent occasional treatments; say, one a week, over a long period. If one does not feel that the patient has been sufficiently treated, it should be continued vigorously at once, and full doses given as often as the skin reaction will permit.

The tubes used were the Muller water-cooled type, carefully selected, and seasoned so that a penetration equivalent to Bauer 9 could be maintained during the entire treatment. If necessary, tubes were changed during the treatment. To this careful selection of tubes the writer attributes much of his success.

On the tour of investigation mentioned above, some cases with skin recurrence beyond the area treated with the  $x$ -ray were seen, the treated area remaining free. In order that the whole field in which recurrence might occur could be reached with the  $x$ -ray, a special lead glass tube shield with straight sides and without a



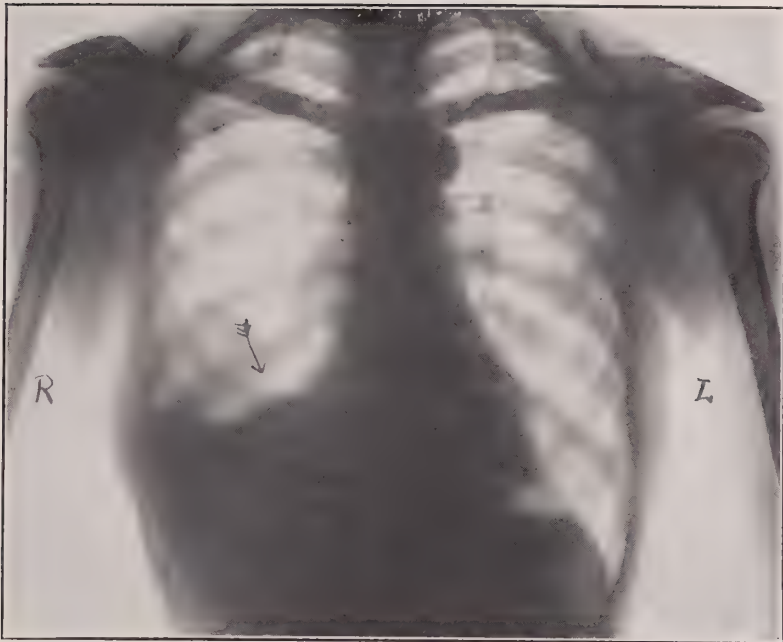


Fig. 1.—Patient aged forty-two years, operated in 1910. Tumor of left breast for two and one-half years. For six months before operation much pain and some secondary skin nodules. Pain in left arm for three months. Tumor attached to chest wall. Plate taken six months after  $x$ -ray treatment. Note involvement at base of right lung, opposite side.



Fig. 2.—Same patient as Fig. 1. Taken three years later. Patient received one series of treatments in 1911 after first plate was taken. No treatment since that time. This plate was taken February 15th, 1914. Further treatment refused. Patient alive, but in very poor health.



Fig. 3.—Patient aged fifty-two. Noticed lump in left breast in 1909. First operation six months later and axillary glands found to be involved. Six months later local recurrence removed by 'medicine.' When first seen by the writer in November, 1911, she had an inoperable local recurrence and much pain in left arm from pressure. Local recurrence and left side treated from November 6th, 1911, to February 23rd, 1912. In March, 1912, radiograph showed tumor in right mediastinum. Left side free. Local recurrence and pain in left arm had disappeared. Patient has since died from visceral involvement.



Fig. 4.—Male, aged fifty-one years. First seen in March, 1912, after three operations on supraclavicular glands on left side. Primary focus unknown. Following last operation left side treated with x-ray. Three months later some evidence of mediastinal involvement. Roentgenograph taken at that time showing tumor involving right lung and visceral pleura. Treatment discontinued. Patient has since died.

bottom was devised. This allowed the rays to reach a larger area than was possible with apparatus existing at that time. That no skin recurrences have resulted in any of the early cases treated, seems to demonstrate that the whole area was thoroughly covered. The bottom of this cylinder was closed with a leather filter.

The writer has treated in all 63 cases following radical operation for cancer of the breast and a number of inoperable cases with skin involvement for the palliative results. Twenty-nine of these were treated between August, 1906 and 1910, and consequently have passed the five-year limit. Thirty-four have not yet passed that period and will not be considered in this communication. Owing to improved technique in the last few years, more favorable results in all classes of cases are expected. Of the 29 cases that have passed the five-year limit, 16 did not show macroscopic evidence of axillary involvement at the operation. The remaining 13 cases had marked axillary involvement. Some of them had had the breast amputated at a previous operation and several had operations for the removal of carcinomatous axillary glands which had developed after the earlier operations. Of these 13 unfavorable cases with glandular involvement, 9 died within six months following the last operation. All but one of these were free from any external evidence of cancer. One patient, alive thirteen months after operation, showed evidences of visceral metastasis, but no external evidence of the disease.

Two cases returned later with evidence of thoracic involvement. One of these patients had such extensive involvement at the time of operation that treatment was considered useless. At the patient's earnest request treatment was given and pushed vigorously. This patient returned two and one-half years later and a roentgenograph showed marked thoracic involvement on the opposite side of the chest. The other patient showed evidence of thoracic involvement, again on the opposite side, one year after operation. This patient received further treatment, and is still alive, now five years after, but is in very poor health.

One case was alive and apparently free from recurrence twelve months after operation; the subsequent history is unknown. The subsequent history of the 16 cases showing no glandular involvement at operation is as follows:—

One patient died fourteen months later from suppurating mastoiditis without evidence of any recurrence.

One patient died two years later from a brain tumor. Pathological examination showed the tumor to be of endothelial origin. No evidence of cancer was found on post-mortem examination.

One patient died after three years from Bright's disease. There was no evidence of cancer at the autopsy.



Two cases treated over eight years ago are alive and free from recurrence.

Three cases treated over seven years ago are alive and free from recurrence.

Six cases treated over six years ago are alive and free from recurrence.

Two cases treated over five years ago are alive and free from recurrence.

From the foregoing it will be seen that 12 of the 13 unfavorable cases showing glandular involvement at operation have died, one is still alive, but with evidence of a recurrence of the disease. Of the 16 favorable cases, 13 are alive and well, five years after treatment. Three patients died from other diseases before sufficient time had elapsed to establish a cure.

Although the total number of cases in the series is too small to use for accurate statistics, yet they are of value in establishing the advisability of post-operative *x*-ray treatment in cancer of the breast.

In all there were 29 cases treated; 13, or 45 per cent., are alive and well after five years. If we exclude the three patients who died of intercurrent disease, the percentage of cures is 55 per cent.

Of the 16 cases showing no axillary glandular involvement at operation, 13, or 81 per cent., are alive and well, after five years. Excluding again the doubtful cases who died before the five-year period had elapsed, but who were found at autopsy to be free from cancerous disease, the percentage of cures reaches 100 per cent. While the percentage of cures, following radical operations in which no glandular involvement is demonstrated, is high, yet the percentage of cures is not as high as in the series herewith reported. It must be taken into consideration that many cases seen by the roentgenologist are not referred by the most experienced surgeons and that the percentage of cures obtained from the average breast operation is low.

That 13 of this series of patients who were treated by both radical operation and *x*-ray treatment have remained free from recurrence, in the writer's opinion is conclusive evidence that all such cases, especially those showing no glandular involvement, should receive the benefit of post-operative roentgen therapy.

The routine treatment given in the early cases was sufficient to obliterate the superficial lymphatics and to destroy or choke out the cancer rests by surrounding them with connective-tissue. If the disease had progressed and there was marked axillary involvement at the time of operation, it is probable that the disease had already extended into the mediastinal glands or abdominal viscera, in which the post-operative roentgen therapy only prevented any external manifestations of the disease. The *x*-ray had a most

marked influence on the mediastinal and general thoracic involvement, as was shown by the fact that when the disease recurred within the thorax it was always upon the opposite side of the chest. This striking fact, which the writer has often observed, is one of the strongest arguments in favor of the post-operative *x*-ray treatment of cancer of the breast.

Regarding cases of advanced cancer of the breast, the results did not seem to justify the effort. Subsequent to 1910, surgeons began to realize and admit that advanced cases were practically inoperable and that a cure by any means was not to be expected.

A number of apparently hopeless cases was treated by the writer from 1910 to 1912. These patients had had extensive operations with dissection of masses of carcinomatous glands from around the axillary vessels. The treatment given in these cases was very thorough. Five cases were treated. All were alive one year later. One case is alive after four years, but with evidence of mediastinal involvement. This is a thin patient in whom, by means of the technique of cross-firing, it has been possible apparently to keep the disease under control. Another case treated two and one-half years ago was recently examined and found to have a mediastinal involvement. As the patient was extremely obese, having gained greatly in weight since the operation, it was not thought possible to control the deeply situated carcinoma.

#### CONCLUSIONS.

1. Failure to obtain results from the post-operative Roentgen treatment of carcinoma of the breast is largely due to faulty methods in its application, among which may be mentioned insufficient dosage and the use of *x*-ray tubes giving too low a penetration.

2. Co-operation on the part of surgeon and patient is absolutely essential for successful results.

3. The immediate use of the ray on the operating table or leaving the wound open for treatment before closure is not necessary. Sufficient treatment can be given through the skin to accomplish the therapeutic effect, provided only that rays of sufficient penetration, proper filters, together with cross-fire technique, are employed.

4. The post-operative *x*-ray treatment has entirely eliminated skin recurrences after the radical operation for cancer of the breast, in the writer's practice.

5. That the *x*-ray is effective in the treatment of carcinoma is evidenced by the writer's observation in recurrent cases of the lessened thoracic involvement on the treated side of the chest, the non-treated areas always and without exception having shown the first signs of metastatic disease.

## THE VALUE OF ROUTINE ROENTGEN EXAMINATION.

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By EDW. S. BLAINE, M. D., of Chicago,  
Roentgenologist Cook County Hospital, Chicago.

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The history of progressive medicine reveals many interesting developments in the art of physical diagnosis. The value of the microscope, the stethoscope, the ophthalmoscope and other instruments has long been known, and these have become indispensable in determining normal and pathological conditions of the human body. To fail to make use of these various apparatus in indicated cases, while making a complete examination of a patient, one would be remiss in diagnostic technique that should not be excused and would immediately brand one so negligent as an incompetent. An additional instrument of diagnosis, the Roentgen ray, has been at hand since 1895, imperfect at first, but of late years greatly improved, so that at present it is an aid of great value in obtaining information that cannot be found by any other means.

It has definitely proved its value in many instances, and as a consequence it is being used more and more in the daily work of men reputed for thoroughness and carefulness in their diagnostic work. There are still a host of doubters who know of this form of diagnosis as of value only in the determination of fractures and the detection of foreign bodies. Presentations of articles in medical literature, setting forth its great value in determining abdominal conditions, are accepted with a shrug of the shoulders or a lifting of eyebrows; they are not convinced of its practical everyday value. Fortunately, these men are of a fast dwindling minority due to better and more efficient instruction in the medical schools of to-day and to the efforts of the roentgenologists who have carefully prepared and presented their findings before the profession. They have repeatedly proved the fact that in other conditions than fractures the Roentgen ray is a valuable aid in diagnosis, in many cases revealing that which is absolutely unattainable by any other method; they have shown by innumerable cases that certain points in the complex picture of the various phases of a given case may be substantiated or negated; they have demonstrated that when a given Roentgen finding be properly correlated with the other physical signs, a correct diagnosis can be made in a larger percentage of cases than is obtained without its aid.



That the greater part of these diagnoses are correct may be verified by checking up with the operative or post-mortem reports. It is true that some cases are incorrectly diagnosed, due to the Roentgen findings, but it would be expecting the impossible were one to require a score of 100 per cent. before accepting this diagnostic method as an aid for routine work. The percentage of correctly determined cases will depend partly upon the skill of the examiner and his ability to give proper value to the various findings on screen or plate.

Seldom do we now find a physician or surgeon who will assume the care and the responsibility of a fracture, no matter how slight it may be, without the aid of a Roentgen examination. True, he will endeavor to find crepitus and he will consider pain, swelling, deformity and the other classical signs, but often the final decision is left to the Roentgen plate. There are men in the profession who will absolutely refuse to take a case of fracture, or even suspected fracture, if the patient will not obtain Roentgen service. The day is not far distant when no one will take charge of such cases without the routine of such an examination, and it will be regarded as a lack of proper professional care in any case in which such examination is not insisted upon. In all probability the courts will hold that proper care was not given in cases where damages are claimed in the event of an untoward result of treatment of a fracture, unless at least one Roentgen examination had been made for diagnosis. The surgeon should, as a matter of protection to himself, have such Roentgen plates as will be a permanent record in case of future legal or professional difficulties.

There are still some of the older physicians who, when asked by their patient as to the advisability of a Roentgen examination, say to them: "Oh, no; I have practised medicine many years before the Roentgen ray was ever thought of and I have set several hundred fractures with perfect results." But if these narrow-minded men had had Roentgen plates of each one of the 'hundreds of perfect results,' they would not be so loud in their self-praise, for a jury would quickly cause them to assume a far different attitude. It is quite true that many reduced fractures which do not appear well on the Roentgen plate will, nevertheless, give a good functional result. But we are striving for more perfect 'pictorial' results largely on account of the inability of the average jurymen to appreciate the difference between functional and 'pictorial.'

Recently a very competent surgeon, who, when he was shown the Roentgen plate of his reduction of a fracture of the femur, said: "Sometimes I almost regret the discovery of the Roentgen ray. This reduction will give a good functional result; the union will be firm; the callus will make a strong bone; no deformity will be noticeable, yet I cannot leave it this way because it does

not 'look good' on the plate. Before the days of the Roentgen ray, many fractures were left reduced just as this is now, and the results were, on the whole, good, but we cannot leave it this way to fall into the hands of unprincipled people who would present such a plate to a jury which would not be able to see anything but the position of the fragments. So I must further reduce this fracture, because the Roentgen plate will not allow me to leave it as it is, although I know the result will be perfect as to function for the patient."

The foregoing is true, however, in but a very small number of cases, as the great majority of fractures are not of this class and the question of 'to ray or not to ray' in these cases is not debatable.

With hospitals equipped with high-powered Roentgen apparatus, the laboratory of the roentgenologist likewise provided and the improved portable Roentgen apparatus for residential and bedside examinations, it surely is a sin of omission in duty if one fails to roentgenize every fracture or suspected fracture that occurs. The careful surgeon will insist on a copy, preferably a reduction of the Roentgen plates of such cases as were cared for by him, for record and reference.

The various bone lesions demonstrable by Roentgen examination exhibit the abnormal bone condition by characteristic changes which represent the manner in which there is a change of disposition of the mineral salts, as, for example, those diseases which are found to be involved in an increase of bone substance as opposed to those which cause a decrease of same. Many of these changes are so well represented on the Roentgen plate as to be almost sufficient in themselves to dictate the diagnosis. The changes noted are of value for deduction and inference in a majority of cases. Although the acute stage of bone diseases is not registered on the roentgenogram (because the inorganic portions are not changed until later), the routine use of this method will save many a diagnostician from error and many a patient will receive better care because of the knowledge gained by this means. Through the routine use of the Roentgen method it will often be found that cases which seem to be acute are far otherwise; and this has been the direct means of revealing many a chronic osteomyelitis which has had a recent exacerbation on top of the old condition. Patients who have been treated for 'rheumatism' by the old-timer, who says he does not need the *x*-ray to make a diagnosis, will be found in some cases, on Roentgen examination, to have a tubercular joint. A case of sore shin-bone will be found, on Roentgen examination, to have a periostitis with thickened cortical bone below, a change which is characteristic of lues. The Roentgen examination made to determine the extent of an injury to an arm may reveal an osteomyelitis of the shaft, or, in some cases, a sar-

comatous bone change. The numerous instances of such occurrences should indicate to the careful physician the absolute necessity for routine Roentgen examination of all such cases.

Of the various branches of medical and surgical work, that of orthopedics is particularly benefited by routine Roentgen examination. It is made much use of by the majority of orthopedists, although one prominent man was heard to say, "I don't need a roentgenogram in most of my cases; my fingers have eyes"; and yet a case in illustration is the following which occurred to the same man after he had reduced a fractured neck of the femur by nailing: The physician who referred the case insisted on a Roentgen examination, which showed that the nail had been driven through the greater trochanter, but had not penetrated the head, it being found above same in the soft tissues. On viewing the roentgenogram, the doctor said: "Well, there you are. If I had had a roentgenogram before reduction, I would have found that this boy had a coxa vara and the angle of driving the nail could have been correctly applied."

The ophthalmologist of wide experience has learned to refer all his cases, in which there is a possibility of a foreign body in the eye, to the roentgenologist, and he is governed by the findings made by one skilled in localization. The important question, Is there or is there not a foreign body in the orbit, and, if so, is it intra- or extra-ocular? is accurately answered by careful Roentgen examination. Its value has been so often proved that it is an invariable practice to make use of this method in all cases of eye injury.

In sinus disease, the Roentgen ray has been of such great benefit that a well-marked path is almost always found leading from the office of the nose and throat specialist to the Roentgen laboratory. One physician has stated that more than 50 per cent. of all his head cases require a Roentgen examination to obtain information regarding frontal, ethmoid, sphenoid, or mastoid regions that he could not get by any other method. However, not all such specialists use this method as a routine. A certain patient had sought relief for troublesome headache with a discharge of pus from the left side of the nose with which he had been afflicted for a long period of time. Visits to a half-dozen specialists brought no relief, although much probing and other local treatment was applied. Finally the case fell into the hands of one who, after reaching the end of his resources, as last resort suggested a Roentgen examination. This brought to light the hitherto unknown fact that a double frontal sinus existed on both sides, there being a thin septum dividing the outer and inner chambers; thus the probing reached only the inner portion, leaving the accumulated pus in the outer section to reinfect continually the other sinuses on that side, and, of course, all treatment was of no avail. How different this



history would have been had the Roentgen examination been made first! Another case in point of illustration is one of a man who had symptoms suggesting trouble in the frontal sinuses. These sinuses did not light up on transillumination, and it was decided that the pus was coming from these cells. Before operative work was started, roentgenograms were made in anteroposterior and lateral directions, which showed conclusively a total absence of the frontal sinuses. The individual variation in the topography of the frontal sinuses makes it almost a necessity for routine Roentgen examination in every case.

Routine Roentgen examination of the teeth in all joint affections will reveal many a case in which there are one or more small foci of necrosis around the roots of one or more of the teeth, and this will direct the point of attack in treatment. When this course is regularly followed, a greater percentage of successfully handled cases will be credited to the physician who uses this method.

Little need be said here of the great value of Roentgen examination to the dentist. One writer on this particular phase of the work has enumerated sixty-four different conditions in dentistry in which a Roentgen examination is of distinct benefit.

The neurologist is calling to his aid the Roentgen method in an increasing number of cases, mainly suspected pituitary changes, some brain tumors, epilepsy, etc. A certain case had been referred for Roentgen examination for sinus involvement of a patient who had been blind for nearly seven years, the cause of which had not been determined. Stereoscopic roentgenograms revealed a pan-sinusitis, but in addition there was also seen a large tumor of the hypophysis which, by pressure, had eroded not only the posterior clinoid processes and dorsum cella, but had extended anteriorly and had encroached on the optic commissure, thus interfering with the nerves of sight and cutting off their function. It is easily seen that the trouble could have been located many years previously had this patient been subjected to Roentgen examination at that time.

The value of Roentgen examination of the thorax is very often forcibly impressed on many who, having made a careful physical examination of a patient's chest and found nothing abnormal, when shown the stereoscopic plates find it hard to believe the evidence before them when it shows marked lung changes. Some of the more progressive men invariably have every suspected pulmonary change examined roentgenographically. There may be some doubt as to the ability of the Roentgen plate to show incipient tubercular changes, but there can be no doubt as to the value of its routine use in every suspected case, because it is so often found that cases with the least physical signs show the greatest changes on the plate. That other pulmonary conditions can be revealed has many times been proved.

It has been found that various heart lesions give characteristic changes in the Roentgen silhouette of this organ. Thus valuable data are obtained, which are of material benefit in arriving at a diagnosis in suspected heart cases. The frequency with which unsuspected aneurysm is found should warn the diagnostician that a routine Roentgen examination is indicated in all circulatory disturbances. In a small percentage of cases the diaphragm assumes an abnormal position and outline which is of value as a diagnostic aid, as for instance, adhesions, subphrenic abscess, etc.

As applied to the region below the diaphragm the most favorably known use is that of examinations for lithiasis of kidney, ureter or bladder regions, and as a routine measure this is a rule that the great majority of physicians follow. It has been shown that upwards of 90 per cent. of all stones can be demonstrated by the Roentgen method. No such examination is complete, however, unless it covers the entire tract from kidney to and including the bladder, as it has been found that pain due to stones may be referred to distant portions of the genito-urinary tract. It has been found that a small ureteral stone located in the lower portion of the ureter close to the bladder causes, in some cases, colicky pain in the kidney; thus all the symptoms indicate a kidney stone, and unless the entire tract be examined, this will be overlooked and a faulty diagnosis will result. The fact must be kept in mind that ten or twelve conditions other than stone may simulate such shadows, therefore the need of care in interpretation of the roentgenograms.

Since the advent of the opaque test meal the gastro-intestinal tract has been added to the list of parts revealed by the Roentgen ray. We are now able to obtain information of value of the various portions from the esophagus to the rectum, and a routine employment of this method will aid many a diagnosis. The over-enthusiasm which followed the earliest work in this line gave way to a feeling of disappointment on account of many failures. This was due to the lack of sufficient number of proved cases, but gradually a store of knowledge has been accumulated, and now we have for use the tabulation of thousands of cases of gastro-intestinal trouble which were subjected to Roentgen examination, found to have lesions, and the abnormal changes noted. By following the cases to the operating room or post-mortem table, these changes were found to indicate certain pathology. The following conditions may be revealed by careful examination: stricture, diverticulum and carcinoma of the esophagus, gastric ulcer, malignancy, etc., duodenal ulcer, etc., adhesions, strictures, twists, some carcinomas, extra-gastric and extra-colic tumors of the small and large bowel. A certain number of cases in which the symptoms point to trouble in the right upper quadrant, if examined with the aid of a barium

meal, will show one or more well-defined shadows characteristic of gall-stones. In fact, the writer has found more gall-stones during a routine stomach examination than during an examination made expressly for the gall-bladder condition.

The internist of to-day who does not use this method as a routine in his diagnostic work can scarcely lay claim to having kept abreast with the progress of modern medical practice. We see on all sides Roentgen laboratories being installed by the internist who finds that it is as necessary for him to have these instruments under his own hand as it is for him to have his own microscope at his elbow ready for instant use. It has been shown that a careful Roentgen examination can reveal lesions as above enumerated, and the question 'to operate or not to operate' in a case of malignancy can be definitely decided by the findings. The writer was present at a Mayo clinic in which he heard Dr. C. H. Mayo state to the visiting surgeons, immediately after he had opened an abdomen and had palpated the stomach, that this was the third and last one of its kind that he would ever operate. He directed attention to the roentgenogram presented of the case, and said that, given that particular shadow, it would indicate to him most conclusively that it was an inoperable one. While his assistants closed up the incision, he delivered a most glowing tribute to the great value of the routine use of the Roentgen method in all cases of gastro-intestinal work.



THE PRESENT STATE OF ROENTGEN CINEMATOGRAPHY  
AND ITS RESULTS AS TO THE STUDY OF THE  
MOVEMENTS OF THE INNER ORGANS  
OF THE HUMAN BODY.

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The so-called Roentgen cinematographs which have been built up to the present in various countries, especially in Germany, were really mechanisms for serial radiographs. They are all founded on the principle of 'falling cassettes' which was first introduced by me.

In the year 1909 I described the first apparatus of that kind.\* In the course of years it has been much modified. Briefly, its most important technical arrangements are here described (Fig. 1).

On a table stand is placed a box whose walls are finished in metal. By means of a horizontally placed partition wall, the interior of the box is divided into two separate secluded chambers of similar size, one over the other, which only communicate with one another by means of a narrow slot. The upper chamber is used as a repository for unused plates. As a rule the apparatus is loaded with twenty-four plates of 24 by 30 cm. size. For these plates, twenty-four cassettes with Roentgen-proof metal backs are used; so that in the necessary arrangement of cases, one behind the other, the Roentgen rays will not penetrate from one case to another. If one works with plates, an intensifying screen is laid in; if films are employed, then the use of two intensifying screens is recommended. The cassettes carry a roller on both ends, which in their turn are laid upon a pair of rails. The latter are stationed on both side walls of the upper repository, a suitable space from the repository floor, so that the single cassettes are freely suspended. The front wall of the upper repository serves as an illuminating window. It is closed by means of a slide produced of material which easily transmits Roentgen rays. In order to press the single cassettes in quick change against the illuminating window and to further promote them to the lower chamber, the following arrangement was affected. Underneath the roof of the upper repository a winding spindle turns, which is propelled by a motor. On it is placed a socket which shoves forward the suspended cases on the rails underneath the spindle, as soon as the

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\*Manufactured by Reiniger Gebbert and Schall, Erlangen and Berlin.

motor sets the spindle in motion. The two conducting rails of the cassettes are so measured that they do not entirely reach to the front wall, but leave a space corresponding to about the thickness of the cassette. As soon as the foremost cassette is shoved to this point, it is tossed from the conducting rails perpendicularly, and falls below into the lower repository through the above-mentioned rift in the partition wall. In order to regulate the fall and to avoid friction to the cassettes from opposite sides, the following trap contrivance is constructed. Running along the front wall of the

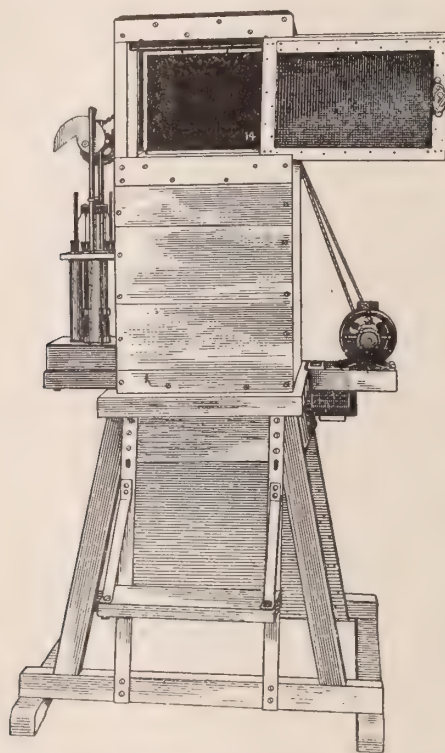


Fig. 1.—Anterior view of Groedel's Falling Cassette Apparatus for making roentgencinematographic serial pictures.

upper repository, on both sides of the illuminating window, are two rails which are built to fit the upper conducting rails of the cassettes, in which the roller of the cassettes fits exactly. As soon as the rails have passed through the precipitating canal they bend gradually around backwards and finally pass parallel to the conducting rails of the upper repository and along the side walls to the rear. The individual cassettes are in this way guided during the fall to the rails as soon as they reach the lower repository, being gradually averted from the perpendicular course, in order eventually to roll on the conducting rails to the rear wall of the chamber (repository), in which they are arranged exactly in the

order of exposition. After the Roentgen operation, the cassettes are lifted from the running rails by means of a door in the rear wall.

A special mechanism presses each individual plate on the patient shortly before the photograph is taken.

In the first years I used a large rotary lead slide with slits for momentary occlusion of the Roentgen rays. More recently I have combined the unipulse interrupter, a beating interrupter, with my apparatus, whereby the whole contrivance is more convenient and the execution of the apparatus more exact.

While with my serial apparatus, and likewise all other contrivances built by me, the taking of only a limited number of pictures a second is possible, one can produce as many as one chooses with an apparatus which I succeeded in building after many years of experiment. This original apparatus (manufactured by Reiniger Gebbert & Schall, Erlangen and Berlin), for true direct roentgen-cinematography is copied from the cinematograph used for ordinary photographs. The accompanying illustration will easily explain its construction (Fig. 2).

We see a large drum provided on the edges with notches, above and below a film spool. From the upper film spool, the film, which is 30 cm. wide and more than a metre long, first of all passes through a small notched cylinder. We then pull it between the two reinforced protectors, but leave between the protector and small-notched cylinder a slide, that is, a piece of film corresponding in height to the illuminating window. Underneath the illuminating window the film is pressed against the notched drum and then guided to the lower film spool on which it is to be rolled up. The large transporting drum is of such dimension that its upper surface corresponds to four times the height of the illuminating window. The transporting drum must therefore move in quick tempo and complete a quarter turn with a jolt in order suddenly to move the film forward to the height of the illuminating window. For this purpose any of the familiar mechanisms can be used. I have hitherto tried out the Maltese cross construction, as also that in the illustrated mechanism with a spiral rail on a propelling drum. The spiral rail fits small sockets that set in fours on the conducting wheel, the latter being coupled securely with the axle of the transporting drum. The rotary propelling drum therefore moves the conducting wheel forward a quarter of a circle by means of the spiral rail, and holds it a short time in the new position, etc. A Maltese cross wheel stationed at the propelling drum works the same way, the construction of which is to-day familiar to every layman. The propelling drum or the Maltese cross is propelled by a motor which, by means of chains, also moves the notched little roller and the lower winding spool.



If we set the works in motion as soon as the electromotor has arrived at a certain revolution, the conducting wheel will suddenly move the transporting drum forward one-fourth the distance of its circumference. In this way the film is pulled forward to the height of the illuminating window. As the film forms, a slide before it passes through the illuminating window, then each time the slide only is thrown forward preventing a tearing of the film. Further on the little notched roll and the lower spool turn continually, the conducting wheel, that is, the transporting drum,

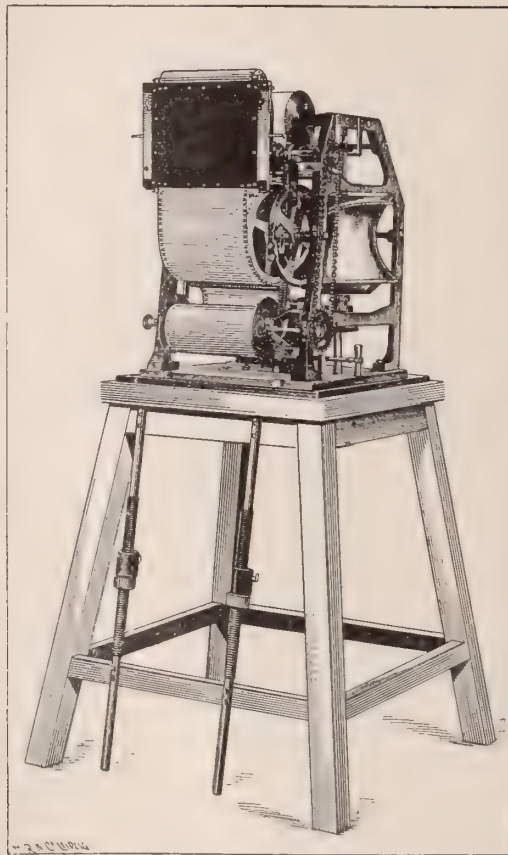


Fig. 2.—Groedel's roentgencinematograph.

only intermittently. While the latter stand still, the notched roller pulls on a fresh film which places itself before the illuminating window as a new slide, to be then pulled in the illuminating window, etc., and simultaneously at the moment of the sudden change, the original film slide below the transporting drum is continually rolled up on the under spool. The coupling of the film-shifting apparatus with the Roentgen apparatus is automatic. The film-shifting motor also propels an interrupter; for example, a double

unipulse interrupter, so that at the time the films are at rest the Roentgen exposure is automatically produced.

According to the foregoing description the subject is very simple. Nevertheless, in reality, there were numberless difficulties to be overcome, of which, of course, I will not further dwell upon here.

Besides these two apparatus, several other methods could be mentioned, for instance, the indirect roentgencinematography, that is, the photographing of the Roentgen fluorescent screen picture by means of an ordinary cinematograph. But since all these methods have few prospects, I will pass them by. In spite of the great technical difficulties of the roentgencinematograph, and in spite of the partly incomplete technical construction, it has already matured scientifically certain important researches which are here briefly specified.

The procedure of motion in phonation and the act of swallowing have up to the present not been completely enough examined to draw any conclusions. The nearest approach is found in works by Eijkman (*Fortschritte*, Vol. V, p. 347), and by Scheier (*Fortschritte*, Vol. XVIII, Hft. 5). The movements of the esophagus have been more carefully examined cinematographically by Kraus (*Deutsch. med. Wochenschr.*, 1912, No. 7), and a detailed publication is still in prospect. It is enough to mention here, first of all, that soft morsels, by the working of the mouth, are spurted through the esophagus and thereupon a peristaltic wave is first set up.

I have studied the movements of the stomach by means of the cinematograph. While Kaestle, Rieder and Rosenthal (*Zeitschr. fuer Roentgenkunde*, 1910, Bd. XII) admit a general peristaltic movement of the entire stomach, more aggravated in the pyloric region, I find three very dissimilar parts in the phenomena of stomach motion. (See my monograph, "Die Magenbewegungen," *Ergänzungsband 27 der Fortschritte*.)

The fundus of the stomach shows practically no movements of its own; the middle, the body of the stomach, shows deep, rhythmic, wave-like movements for transporting chyme, which are mostly produced by mechanical momentum. Small, very slow, wandering-like, arhythmic movements are copiously set in motion, which probably serve as an aid to the digestion. At the antrum pylori two distinct forms of movement are discernible. The emptying of the pyloric portion of the stomach appears as a complete contraction, mostly concentric, oftentimes eccentric, and simulates small balloons following each other. Some of the gastric contents seem to go forward through the pylorus and some backward into the stomach. The sphincter antri is more or less tightly contracted during this action (Fig. 3).

Alternating with this movement, another form of movement of the antrum is to be observed—the mixing motion, which takes

place as the deep rhythmic peristalsis of the pars media passes the sphincter antri and travels toward the pylorus. It probably has the purpose of mixing the contents of the pars pylorica, but can at the same time contribute towards the transporting of chyme into the duodenum, if the pylorus opens during its flow. Both movements can frequently appear in a special case.

Rather similar findings were shown in children's stomachs recently. Alwens and Husler (*Fortschritte*, Vol. XIX) and Dietlen (*Beiheft zur Medizin. Klin.*, 1913) arrive at similar conclusions.

The cinematographic examinations of Fränkel and others apply chiefly to the pathological stomach.

By means of cinematographic exposures, Kæstle and Bruegel have been able to demonstrate mixing as well as kneading movements in the small intestine and also peristaltic forward movements (29th Kongress fuer Innere Med.).



Fig. 3.—Increased peristalsis of the stomach (rhythmic peristalsis) and increased antrum peristalsis in *tabes dorsalis*.

The movements of the large intestine have likewise been followed up by means of the cinematograph. Attention is called to the fact that von Bergmann was able to confirm in this manner the retrogressive movement of residues in the large intestine.

The study of the breathing mechanism by cinematography has, up to the present, been relatively meagre. I have reported my experiments to determine the influence of normal respiration upon the size and position of the heart (*Zeitschr. fuer klin. Med.*, Bd. 72, Hft. 3 and 4).

Briefly, my deductions were as follows: During normal breathing the heart moves more or less vigorously up and downward, corresponding to the excursion of the diaphragm. But as the right diaphragm usually exhibits a more limited excursion than the left half of the diaphragm, and as the heart is also fixed upon the right



by means of the vena cava, the left side of the heart is moved more vigorously during respiration than the right; the heart often turns itself, as it were, around a point located at the place where the right diaphragm and right auricle meet. Also slight lateral respiratory displacements are observed, more frequently, for the above illustrated reasons, to the right than to the left. An inspiratory increased heart volume is not existent according to roentgencinematographic observation. An inspiratory decreased heart volume is almost always an illusion, dependent upon the inspiratory dislocation of the heart shadow produced by the above-described turning motion. But exact measurements show that in quiet respiration no diminution occurs, consequently no change in dimension. Even in deep or maximum forced inspiration, the decrease in the transverse diameter of the heart is so meagre that it hardly exceeds the pulsatory palpitations of the heart. On the other hand, the intensely small decrease in the transverse heart dimension is fully compensated by the most significant increase in vertical diameter. Also an inspiratory increase or decrease in volume of an individual heart cavity cannot be noted by the roentgencinematograph; neither can an increase in heart dimension, at the beginning of the inhalation, be demonstrated.

Concerning the roentgencinematographic examinations in abnormal respiratory movements of the thoracic viscera, I have reported them in detail (*Fortschritte der Medizin*, 1913, No. 30).

Especially interesting and also especially difficult is the study of heart movements. This part of roentgencinematography is rich in expectation, nevertheless only by the simultaneous use of electrocardiography. Jointly with my brother, Dr. Theo. Groedel, I have been able to overcome the difficulties, after many years of experimental work, that stood in the way (*Deutsches Archiv. fuer klin. Med.*, Bd. 109, and *Deutsch. med. Wochenschr.*, 1913, No. 17). Only the most important technical measures are here specified.

If we attach an electrocardiograph to a patient who is in the normal examining position before the roentgencinematograph, the galvanometer of the electrocardiograph is violently affected by the high potential current of the Roentgen apparatus, even if the Roentgen tube is not connected. It is unnecessary further to discuss that the influence on the electrocardiogram, which is dependent upon the use of the induction apparatus, can only occur by reason of the magnetic influence which is generated during the running of the Roentgen apparatus. By observation we found that there is a neutral zone within which these magnetic influences, passing from the inductor to the electrocardiograph, have no demonstrable effect. This zone is the component which results from the force of earth magnetism and the force of apparatus magnetism, and can be established by the aid of the

magnetic needle, which remains uninfluenced within this zone, as the current is turned off and on, but beyond which, however, it will be influenced.

When making exposures, to avoid derangements of the electrocardiogram, caused by the apparatus magnetism, it will be necessary for us to set up the cinematograph in such a place that the patient is placed exactly in the neutral zone, which is most easily attained in the following manner, *i. e.*, the longitudinal axis of the inductor as well as the longitudinal axis of the cinematograph and the corresponding sagittal diameter of the patient are focused in a north and south direction. The influence of the apparatus magnetism upon the electrocardiogram could be recognized and prevented after we succeeded in eliminating the electric power passing from the Roentgen tube, which also greatly disturbed the electrocardiogram, especially the static charging of the body from the Roentgen tube.

If we flash a Roentgen tube behind the patient connected with an electrocardiograph (or a metal conductor), it will frequently happen that the delicate thread of the galvanometer is destroyed. Not until a permanent magnet was used in the place of the electromagnets could we evade this, but even in electrocardiographs with permanent magnets, at each flash of the Roentgen tube the thread of the galvanometer is momentarily pulled out of the vacuum line and falls for some time into violent vibration, through the slowly ebbing static electricity from the body into the instrument. We then have condensers of very large capacity inserted parallel to the circle of the electrocardiogram current and connected on one side to the earth. We could not, of course, thereby entirely eliminate the influence upon the galvanometer during the moment of the tube's action, but we have at least produced a few tenths of a second's rest after a Roentgen exposure. The influence of the static radiation coming from the tube can only be completely eliminated when one inserts, outside the condensers between the tube and patient, a double, well-earthed metal wall, whose diaphragmatic opening necessary to the passing through of Roentgen rays can be closed off with metal foil.

In conclusion, the results are briefly summarized, which we have obtained up to the present by means of the combined roentgen-cinematographic and electrocardiographic heart examinations (Fig. 4).

During the auricular curve of the electrocardiogram, one sees on the plate a differentiation between the auricle and ventricle. The auricle is at maximum contraction and is placed next the ventricle curve as a straight line.

During the transition period the differentiation vanishes, the ventricular and auricular curve pass almost imperceptibly one into the other; the auricle is again relaxed.

From the beginning to the end of the cardiographic cycle, a distinct differentiation is found between auricle and ventricle. The auricle appears as a straight line which increases in length from the J. to the F. curve on the electrocardiogram (Fig. 4). This does no longer signify a contracted condition of the auricle, but rather a stretching of the auricle wall, which is muscularly weak, by means of the contraction of the ventricle. The ventricular curve becomes constantly more strongly arched and shortens itself always as the point moves toward the middle line. At the end of the final curve (F) the ventricle has arrived at its maximum contraction, the auricle at its utmost stretching and extension. According to the Roentgen pictures, one could admit that the actual *punctum fixum* for the contracting ventricle is the large vessels from which the annulus fibrosus, by means of the auricle, appears to be suspended.

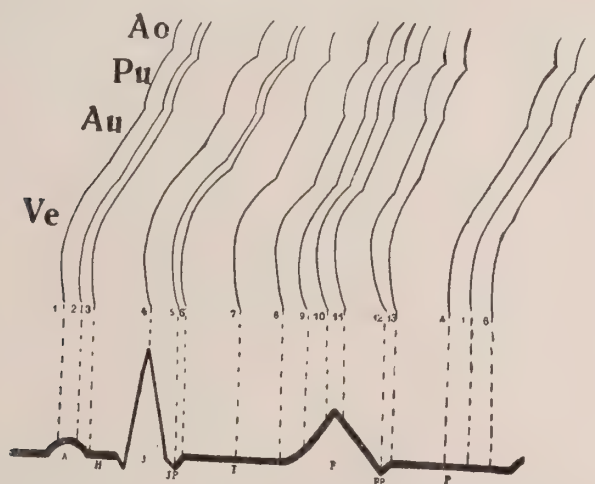


Fig. 4.—Change in form in the border of the left heart shadow during the evolution of the heart movements as shown in the electrocardiogram.

With the beginning of the pause (P), the arching of the ventricle subsides, the extent of the auricular arch again becomes smaller until soon the two do not separate from each other any more. The filling of the relaxed ventricle increases, the apex of the heart is again pushed outward.

Furthermore, we come to the following very important conclusions for the interpretation of the electrocardiogram as a result of our observations.

That the cardiographic curve (A) corresponds to the contraction of the auricle has until the present been accepted as certain by all authors; our examinations also confirm this assumption.

There is not the same harmony of opinion concerning the initial curve. Some authors assert this to be the electrical equivalent of the emotion-conduit, while others hold it to be expression of heart



action, whereby action must be understood as emotion-conduit, chemical change, production of heat and mechanical contraction. If we ourselves cannot distinguish which of these factors takes part in the forming of the initial curve (J), we can, however, admit as positive, on the support of our examinations, that the contraction of the muscles takes part in the formation of the initial curve. This we consider the most important result in our research.

Of the final curve (F), we can only say that in its course the ventricular contraction reaches its maximum height and that immediately at the close of the final curve the ventricular diastole begins.

Our examinations show in reality that the potential vibrations, as they are recognized in the electrocardiogram, go together synchronously with the heart action.

This brief summary shows sufficiently that in spite of present inadequate apparatus, important questions have already been solved, or the solution thereof brought nearer, and that the roentgencinematograph will play an important rôle in scientific cinematography in the near future.

## ROENTGENOLOGIC DIAGNOSIS OF VISCEROPTOSIS.

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By ADOLPH HARTUNG, M. D., of Chicago.

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If by visceroptosis we understand merely the downward displacement of the abdominal organs, then the diagnosis of this condition is rendered extremely simple and accurate by means of the Roentgen ray.

Experience has shown, however, that even in perfectly normal healthy individuals there may be wide variations from what we have been accustomed to consider normal. Type of build, state of nutrition, age, sex, and, most important of all, hereditary or congenital anomalies must be taken into consideration in determining whether the position shown is normal or pathological. The chief value of the roentgenographic examination lies in correlating unusual position with impaired function as a basis for the symptoms, and ascertaining whether extraneous factors such as adhesions may not be primarily or secondarily responsible for the changed conditions.

As regards the technique used in determining the position of the various viscera, an ordinary roentgenogram may under especially favorable circumstances give considerable information. It may outline such solid organs as the liver, spleen and kidneys, and such parts of the gastro-intestinal canal as may be filled up with air or gas. In the case of the stomach and bowel, however, we fill these organs with an opaque meal whose shadow may be taken to represent the organ itself with practical accuracy. Fifty to 100 grm. of a bismuth or a barium salt added to about 350 grm. of some gruel or fermented milk answers very well and can be traced throughout the tract. When the colon is wanted it is often preferable to give an enema of bismuth or barium suspended in some mucilaginous media because nature does not always distribute the meal in such a way as to give us the desired information. The meal, however, has the advantage of giving us information regarding motility which can be gotten in no other way.

At this point, the writer wishes to answer one of the favorite arguments and objections originally made by Stiller, and commonly used, that the heavy bismuth or barium is directly responsible for the *Zerrungsbild* or distorted image, and that this is not a true picture of the conditions ordinarily present. The little added specific gravity of the meal is practically negligible. Grædel proved this experimentally by sewing small metallic beads to the greater curvature of stomachs of animals and then making tracings of the lower

pole with an ordinary meal, and with a bismuth meal found that the outlines coincided.

Exactly what constitutes the normal position and mobility of the different abdominal organs is rather difficult to decide. The textbook position, obtained from the study of the cadaver and from the operating table, can hardly be accepted as accurate, as these studies are made under conditions where various factors which determine position are permanently or temporarily inactive. Apparent discrepancies can readily be explained if this is borne in mind.

Roentgen ray examinations for visceroptosis, whether it be by the screen or graphic method, had best be made in upright position, although it is well to supplement this in the horizontal plane, and even in the Trendelenburg to determine mobility. The navel, which is ordinarily taken as the landmark, is apt to vary so much in these cases that it is hardly reliable. Instead of using a marker at that point, the writer prefers to use as a landmark that point on the spine which corresponds in projection plane to the navel in the average normal individual. This is about on a line drawn from crest to crest of the ilia or disc between the fourth and fifth lumbar vertebra. Others use the symphysis pubis as their basis of measurement.

The limit usually given for the lower margin of the normal stomach is the umbilicus in the horizontal position and about 1 to 2 in. below that in the upright. From what the writer has said previously, it follows that this position may represent a marked ptosis of a normally high stomach. The ptosed stomach may extend anywhere down to the symphysis. As it sags downward its two fixed points of suspension, the cardia and pylorus, approximate each other so that the entire stomach is found to the left of the median line instead of extending to the right of it. The pylorus and first portion of the duodenum may be dragged down with it, but the second or descending part, being retroperitoneal, usually remains stationary. In addition to being ptosed, the stomach may be atonic and dilated. Instead of emptying itself within the usual six hours, ordinarily set as the outside limit for this meal, it may retain food from eight to twelve hours or even longer. Instead of embracing its contents, these may sink to the lower pole as in a flaccid bag.

The small intestine can hardly be said to have a definite location, as it ordinarily fills in all the space not occupied by other organs. The bismuth or barium meal passes through it quite rapidly, reaching the terminal ileum in about four to six hours after ingestion. This part usually is located at or near the upper level of the true pelvis, but may be displaced downward considerably, producing kinks such as described by Lane. Ptosis of the small intestine and



consequent drag on its mesentery may interfere with the emptying of the stomach contents on account of pressure exerted at its upper attachment, in the region of the ligament of Trietz, upon the duodenum.

As regards the cecum, this usually lies in the iliac fossa, but it may sag down even to the symphysis—the cecum mobile of Wilms. The ascending colon, instead of being retroperitoneal, may have a mesentery which may permit it to be dropped down in part and thus double on itself, or be ptosed *in toto* with the cecum. The hepatic flexure is fastened to the external posterior wall just below the lower border of the liver. It may be ptosed independently or rarely in conjunction with that organ. If the liver is enlarged or deformed, it pushes this flexure before it. A few cases of *Wander Leber* (wandering liver) have been reported in which the flexure has crowded itself between the liver and the diaphragm.

The transverse colon is next to the stomach the most liable to ptosis. Ordinarily, it is found just below the stomach. It must be borne in mind that the empty stomach, being contracted, is much higher than the filled, hence the location of the colon will vary accordingly. It follows the greater curvature closely to the splenic flexure which is fastened to the postero-external wall by means of the splenocolic ligament at a higher level than the hepatic flexure. Rarely, it may be ptosed independently of the stomach, and be separated from it by quite an interval. It may extend way down to the symphysis in a V-shape, or doubling directly upon the ascending or descending colon or both, produce a variety of configurations. The splenic flexure is usually the most fixed part of the gastro-intestinal tract; if it is ptosed it is generally found that all the other abdominal organs are also displaced downward. Rarely, it also may insert itself under a movable liver. The descending colon is usually retroperitoneal, and occasionally it also has a mesentery and is found in unusual locations. The sigmoid flexure extends up to about the upper margin of the sacrum. It, too, may be ptosed and lie directly upon the rectum. Regarding motility of the colon, normally the cecum and ascending colon fill up in six to twelve hours; in twelve to twenty-four the bismuth meal is distributed throughout the colon, and is evacuated entirely or in great part in twenty-four to thirty-six hours. In ptosis there may be a variable amount of stasis which may be localized or general. The contents may remain for days or until a cathartic is given. In these cases it is particularly important to determine whether the atony alone or some complication is present.

Ptosis of the kidneys, especially of the right, is comparatively common. At times it is an advantage to insert a shadowgraph catheter or inject the pelvis of the kidney and ureter with a silver solution and thus show its position more plainly than can be done

otherwise. In this way also kinks of the ureter due to kidney ptosis can be shown.

A wandering spleen or liver is a comparative rarity, and palpation usually gives all the information needed to make the diagnosis. The upper margin of the diaphragm fairly represents the upper boundary of the liver, and the upper limits of the hepatic flexure and first portion of the duodenum usually indicate its lower outline. Occasionally a Riedel's lobe can be outlined along the ascending colon. The spleen frequently leaves its impression along the greater curvature of the stomach.

Isolated ptosis of one organ rarely occurs; usually different ones are involved to the same or varying degree. In all these cases, as complete a Roentgen examination as possible should be made to determine, if possible, the cause of the accompanying symptoms. Visceroptosis should, the writer believes, be an exclusion diagnosis. A low position of the organs *per se* should only be accepted as the cause of the symptoms after all other possible causes have been excluded. The next step, and it is here that the Roentgen ray will undoubtedly prove of greatest value, is in determining which of these cases are surgical and which medical. Where we find congenital anomalies, which can be corrected, or where the changed position and consequent stasis have superinduced adhesions, there surgery is clearly indicated. Uncomplicated cases, where loss of nerve and muscle tonus and absence of adipose tissue are evident, can certainly be greatly benefited by medical treatment alone.

## THE PRICE OF PROGRESS.

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By J. B. WANTZ, E. E. M. E., of Chicago.

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For the past twenty-five years I have been connected with what is now the largest house furnishing electrical and mechanical appliances to the medical profession. Almost from the beginning this company's line embraced a very large variety of instruments and enjoyed a wide patronage from medical men who were interested in physical therapy.

The foregoing statement is made simply to evidence the extent of the fund of experience from which I have drawn the inspiration for the thoughts that follow.

It is not my purpose to criticise in the physician the manifestation of a characteristic, to a certain extent common to all men, but rather to point out how this mental attitude works to the disadvantage of the individual physician, to the profession at large, and to the development of medical science.

It frequently happens that a physician, after having purchased a piece of Roentgen or other apparatus, some time later learns that an improvement has been made in this type of machine or instrument, and he is filled with a vague resentment. This resentment is not directed against anyone in particular; he simply feels that the value of the apparatus he has purchased has deteriorated through no fault of his own. Now, if he possesses the characteristic (to which reference has been made) in an aggravated form, he will vow that he will not be caught a second time; perhaps saying to himself, "You no sooner buy a machine than the thing is out of date."

The recent rapid developments in the science of roentgenology, forcing, as it has, the apparatus designers to work almost day and night to keep pace with the demands of the progressive roentgenologists for improved types of apparatus to meet the new improved technique, has caused a widespread manifestation of this mistaken attitude, and a part of the resentment is occasionally directed against the manufacturers.

We frequently hear a doctor express himself to the effect that he is afraid that, if he does buy a machine now, in a short while something better will appear and his equipment would then be, to a certain extent, out of date. For this reason he is inclined to wait, not seeming to realize that if he keeps waiting until all danger of this character has disappeared, he will wait forever. Roent-



genology will have lost another possible 'big man,' and mankind will have lost the share this man would have had in waging the war against diseases, and the doctor will have lost the joy of fighting a good fight, the joy of original investigation and achievement and whatever honors and profits might be connected therewith.

All this doctor wants you to do is to build a machine which will not be improved upon; that is, a perfect machine, perfectly adapted for all present requirements and to meet all future developments. It has always been my policy, and is, no doubt, the policy of the other designers in this field, to look forward as far as possible in making provision for future developments. However, it is hardly necessary to call attention to human limitations when it comes to attempting to peer very far into the future.

The fallacy of the 'perfect machine' idea, as applied to *x-ray* apparatus, may perhaps be made a little more apparent if we compare the development of the automobile to the development of the high tension generator for *x-ray* work. When the idea of an automobile was first conceived and given practical form, the best form of applying the power was by means of a steam engine; so the steam engine was first adapted for use in the automobile. A little later more power was wanted, and the limitations of the steam engine for use in this connection being recognized, investigators worked along different lines, with the result that the gasoline engine was developed for this purpose. The first gasoline automobile engine was a single cylinder affair, which, as the demand for more power and flexibility increased, was developed into a two, three and, finally, a four cylinder machine. The automobile manufacturers thought that that was as high as they would ever go, because they now had 'power on every stroke.' Again the demand for more power forced them on. This caused first an increase in the size of the cylinder. Then we had the six and now the eight, with the prediction that in the near future a twelve cylinder automobile will make its appearance.

When Roentgen first made his discovery, the static machine was the only practical high-tension generator suitable for the purpose of exciting the *x-ray* tube. Soon, however, the limit of the static machine was reached and passed, and the induction coil took its place. The induction coil itself rapidly passed through various stages of development, more particularly as regards the form of interrupter used—as, for instance, the hammer break, the mercury break, the mercury turbine break and, finally, the electrolytic break.

Here, as is the case of the four cylinder auto, it appeared as if the limit had been reached, but the insistent demand for more power forced the development of an intensified induction coil, and finally that of the interrupterless transformer now in favor. The

interrupterless style of apparatus appeared first in the two-kilowatt size, closely followed by three, five and ten kilowatt, etc., until now it is possible to procure up to a twenty-five kilowatt apparatus.

There is another parallel between the development of the automobile and the Roentgen apparatus. Whenever in either case there was a lull in the demand for more power, the designers turned their attention to the simplifying of the existing types of machines. In the same way as the automobile manufacturers have replaced the crank with the self-starter, the lever gear shift with the pneumatic or electric gear shift, the gas or oil lamps with the electric light, so have the progressive manufacturers in the Roentgen field replaced the multiplicity of impedances, inductances, etc., with their confusing complication of switches, with the 'single lever control.' It is evident, then, that the 'perfect' apparatus, or the apparatus which will not be improved upon, will be produced just as soon as roentgenology fails to progress. This, however, will be a sad time for all interested, for in this world there is no standing still; we either go forward or we go back.

It is a mistaken idea and nothing could be farther from the fact than to suppose that manufacturers made changes in their designs simply to make it possible for them to ask the doctor to discard his old apparatus in favor of the new. The logical position of the manufacturer is that he must cater to an existing demand. With very few exceptions, he does not change a model or design until the voice of progress, speaking through competent scientific medical investigators, demands the change.

As a matter of fact, it is upon the manufacturer that the burden of expense falls first and most heavily. The following specific example will, to a certain extent, illustrate this point. The average doctor, who did radiographic work before the interrupterless came into use, invested probably from \$600.00 to \$1,000.00 for a first-class coil and the accessories necessary for its operation. Each manufacturer invested thousands of dollars in drawings, tools, dies, patterns, etc., in order to manufacture this type of coil. When the interrupterless came into favor, it did not necessarily follow that the usefulness of the coil in the doctor's office was, in any way, impaired. He could take just as good a picture just as quickly with his coil after the advent of the interrupterless as before. In one sense of the word, his money was just as well invested as ever, although it was true that he could no longer get as much for the coil if he wished to sell it. Now, the position of the manufacturer was as follows. The demand for coils practically ceased; his investment of thousands of dollars in manufacturing facilities was wiped out, and in addition all the results of experimental work done in connection with the development of coils were of no service and their cost was a total loss. Again, the cost of training a

large body of men to make a certain type of machine is also, in a measure, a loss; besides this, the cumulative value of many advertising campaigns to push this article and educate the profession in its use was almost entirely lost. He must set his engineers to the task of designing the details of the new machine, experimental work must be done, drawings must be made, necessary dies, patterns and tools furnished in order to carry the new apparatus through all the manufacturing processes. If he is a progressive manufacturer, he resigns himself to the inevitable, realizing that he is simply paying his share of the 'price of progress.'

The doctor, who is not willing to pay any part of the price of progress, is waiting for a time when there will be no necessity for contributing, that is, when there will be no improvements possible and the perfect machine will have arrived. In the meantime, the real workers have their shoulders to the wheel and are doing great things in the world's work. They are daily becoming richer in the best things of life—in the respect of their fellowmen, in the accumulation of knowledge, experience, and whatever these may mean from a pecuniary standpoint.

It is just as foolish for the doctor to sit outside watching his professional brethren reap the benefits and honors of applied roentgenology while he waits for a perfect machine, as it would be for him to make all his professional and pleasure calls on foot while he waits for the arrival of the perfect automobile.



EIGHTY ROENTGENOLOGISTS ATTEND AN INFORMAL  
CONFERENCE HELD AT THE HOTEL CHALFONTE,  
ATLANTIC CITY, JANUARY 29TH AND 30TH, 1915.

On Friday evening the meeting was called to order by Dr. David R. Bowen, of Philadelphia. Dr. George C. Johnston, of Pittsburgh, was elected as presiding officer.

The discussion of the "Roentgenologist and the Hospital" was opened by Dr. H. K. Pancoast, of the University of Pennsylvania Hospital, Philadelphia. He stated that he found it advantageous to have fixed portions of each day devoted to the examination of three classes of patients—(1) Ward patients; (2) private room patients; (3) private out-patients. The roentgenologist fixes the fees, of which the hospital retains one-third. The hospital pays all expenses of installation and maintenance. The roentgenologist is a member of the medical staff, and has a professorship in the University Medical College. He has absolute charge of all cases while they are under Roentgen examination or Roentgen treatment. The Roentgen Department has no separate hospital service as yet.

Dr. I. S. Hirsch, Bellevue Hospital and Post-Graduate Medical School and Hospital, New York, called attention to the value of the German custom of having official visits to the Roentgen Department by the heads of the other departments at stated hours, at which time the head of the Roentgen Department is expected to be present, and a general consultation on all doubtful cases is held, correlating the clinical and Roentgen findings. The roentgenologist should receive adequate compensation indirectly from the hospital or directly from private patients.

Dr. Willis F. Manges, Jefferson Medical College and Hospital, Philadelphia, stated that in the Jefferson Medical College he held a teaching position; he was accorded a position on the medical staff, and that all private patients examined in the Roentgen Department were considered as the roentgenologist's private patients.

Dr. Percy Brown, Harvard Medical School, Boston, thought that except in private hospitals and teaching hospitals, no roentgenologist should accept a direct salary; that accepting a salary from a general hospital would preclude the roentgenologist from proper professional recognition.

Dr. F. H. Baetjer, Johns Hopkins Hospital, Baltimore, laid emphasis on the recognition of the roentgenologist as a consultant, also on the form of the roentgenologist's report, and deplored the custom of giving out prints. He spoke of the difference between endowed and unendowed hospitals.

Dr. J. F. Case, Battle Creek Sanitarium, Battle Creek, Mich., thought that the words 'pictures' and 'laboratory' should be tabooed in the roentgenologist's vocabulary.

Dr. J. H. Selby, Washington, D. C., called attention to the condition of roentgenology in Washington, D. C., due to the financial policy practised by the Government in the Army Hospital Medical School and the abuses attendant thereon.

Dr. L. G. Cole, Cornell University Medical College, New York, cited personal experiences of the abuse of Roentgen service in various New York hospitals.

Dr. B. C. Darling, New York, divides his hospital patients and their fees into four classes:—

1. Private patients of the hospital visiting staff. These patients he charges his regular office fees, subject to the approval of the member of the attending staff who has charge of the patient.

2. Private patients who enter the hospital for Roentgen work and are unassigned to any member of the attending staff. Such patients are considered as the roentgenologist's private patients.

3. Corporation employes who are treated under the Workingmen's Compensation Act. The roentgenologist retains all of the fee allowed for Roentgen work by the State statutes.

4. Ward patients.

The roentgenologist pays his own assistants, and does not divide his fees with the hospital.

Dr. E. W. Caldwell, Presbyterian Hospital, New York, called attention to the dangers of trusting too much to a technician.

Dr. Geo. C. Johnston, of Pittsburgh, said that the hospital in which he took most satisfaction was a children's hospital, in which he had never received any direct or indirect financial compensation, but "that on account of the friends he had made among these children he expected to get into Heaven, whether he deserved to or not, because if those children inside Heaven's walls saw him turned away from the gate by St. Peter, they would raise Hell in the place." Most hospital connections resulted in loss and dissatisfaction to the roentgenologist.

Dr. Charles Eastmond, Brooklyn, N. Y., Dr. W. H. Stewart, German Hospital and Harlem Hospital, New York, and Dr. M. B. Palmer, Rochester, N. Y., also spoke.

Dr. A. F. Holding, General Memorial Hospital, New York, had recently sent a questionnaire to leading roentgenologists and hospitals, and, based on this, divided hospitals into four classes:—

1. Private hospitals.

2. Teaching hospitals.

3. Research hospitals.

4. General hospitals.

In hospitals of the first three classes it was proper that the roentgenologist should receive a salary, as he could not expect any direct remuneration from the patients. The majority of the hospitals throughout the country came under the fourth class, and the work was done in hospitals, whose staffs paid too much attention to economy and too little attention to competency in Roentgen work, by local roentgenologists who could not dictate their own terms as acknowledged experts in metropolises could; so that to assist such roentgenologists and such hospitals to support and maintain, on a proper basis, a competent Roentgen laboratory, influence should be brought to bear on the American Roentgen Ray Society and the National Society of Hospital Superintendents to make a canvass of hospital arrangements in existence in the best medical centres, and to outline equitable methods of organizing and maintaining Roentgen Departments, particularly in the small cities throughout the country.

A committee consisting of Dr. W. H. Stewart, Chairman, Dr. F. H. Baetjer, Dr. H. K. Pancoast, Dr. J. F. Case and Dr. A. F. Holding was appointed to present resolutions for discussion on the topic, "The Roentgenologist as a Consultant."

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SATURDAY, 9:30 A. M.

Dr. Charles Eastmond, Brooklyn, in his paper on "Roentgen Diagnosis of Cardiospasm," called attention to the need of incorporating the fluoroscopic inspection of the deglutition of the bismuth meal, especially its passage through the lower end of the esophagus, as a routine procedure in all complete Roentgen examinations of the stomach. Cardiospasm presents—(1) Associated with spastic conditions of the gastro-intestinal tract; associated with pylorospasm, tight sphincters, etc.; (2) associated with other actual gastric lesions, as ulcers, etc.; (3) in idiopathic cases. Cardiospasm is characterized by (1) smooth margins; (2) transitory stasis in and distension of the esophagus at some time, showing the full diameter of that tube. Technique: Cardiospasm can frequently be excited by having the patient drink a glass of ice water just previous to the swallowing of the bismuth.

Dr. Arial W. George, Boston, showed lantern slides of

1. Adenocarcinoma of lung.
2. Giant-celled sarcoma of head of femur with spontaneous fracture.
3. Myositis ossificans of ischium.
4. Scurvy showing characteristic epiphyseal line lesions.
5. Scurvy, general, showing characteristic multiple subperiosteal hemorrhages (case unrecognized in a well-known hospital with a Roentgen Department).
6. Two cases of brain tumors, one of them located so that the main symptom was 'loss of memory,' and was declared inoperable in a large hospital having a Roentgen Department. Case when stereoscoped showed the tumor to be peripheral and operable, and not central and inoperable as diagnosed in the hospital.
7. Typhoid spine.
8. Spinal lesion; new growth or syphilis.
9. Three cases of early annular carcinoma of the pylorus.

Dr. George E. Pfahler, Philadelphia, in his paper on "An Improvement in the Technique of Gall-Bladder Examinations," demonstrated the results of increased accuracy in diagnosing gall-stones by roentgenographing at various oblique angles. The new technique is especially useful in differentiating gall-stone from kidney stone, and consists in placing an 8"x10" plate, with a corresponding size board, in the usual position for an examination of the right kidney and making an exposure as would be made for the right kidney, then turning the patient at an angle on the right side and making another plate with the rays passing under the right costal border. He then turns the patient almost on his right side, and again makes another plate, passing the rays through the epigastric region and under the right costal border. This will project the shadow of any gall-stone outside the kidney line. He generally makes three or four plates in these positions. Dr. Pfahler then turns the patient upon his abdomen, bending the spine strongly to the left and compressing the plate into the right hypochondriac



region, and makes three or four plates in different positions, the rays being centered toward the gall-bladder region each time. By following this technique, after thorough purgation and with an empty stomach, and then carefully studying the plates by oblique illumination with a white light coming from a single direction, he believes one should detect at least seventy-five per cent. of gall-stones.

Dr. James T. Case, Battle Creek, reported 13 cases of multiple diverticula of the colon shown by Roentgen examinations. Average age of the patients was sixty years. Colonic diverticula are due to pressure, and present at the weakest points of the colon, such as along the mesenteric border, where blood-vessels pierce the colon wall, etc. The smallest number present in a single case was four, the largest number over a hundred, the average number about thirty—found most commonly in the pelvic colon. Symptoms varied from those of colitis to those usually presented in carcinoma of the colon. Lesions can be demonstrated roentgenologically when the bismuth is given by mouth or by enema, and are characterized by the presence of shadows cast by many small collections of the bismuth in the various diverticula, 'multiple residues.' These persist for many days—in one case, examined sixteen days after bismuth ingestion they were still present.

Discussion by Drs. Baetjer, LeWald, Quimby, Bassler.

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Prof. J. S. Shearer, of Ithaca, N. Y., presented a paper on "Recent Developments in Roentgenology," which was confined to certain recent measurements on timers and tube characteristics made by the author and his students. Slides were shown indicating the excellent performance of the Wappler serial timer as regards accuracy of reproduction. A careful study has been made of many tubes of the gas containing type showing their behavior under a great variety of conditions. These characteristics are best shown by the voltage required to pass various currents through the tubes. It was shown that the same tube would give a variety of results according to the treatment just prior to use, etc. The new hydrogen tube brought out recently by the Snook-Roentgen Co. was included and it was shown that it is a great improvement over the usual gas tube in many respects. It has a tendency to increase in hardness on even fairly heavy currents. It seems to the writer that all tubes give the same penetration when operated at the same voltage if their targets are of the same material. Further tests are to be made on this point. An opinion was also expressed that measurements by the ionization method should not be regarded as conclusive since they only indicate the amount of radiation *absorbed* and not the total. The writer hopes to publish an extension of the work reported, probably in the *American Journal of Roentgenology*.

Dr. L. T. LeWald, of New York, discussed "Anomalies of the Ribs and Spine," with lantern slide demonstration.

Dr. F. B. Granger, of Boston, discussed "Further Results in the Production of Sterility by the Roentgen Ray." He gave a résumé of some of the cases which had come under his treatment. Sterility had already been produced in guinea-pigs through use of the *x*-ray. He reported one case, which eight years after the last *x*-ray exposure showed complete absence of spermatozoa, with absolutely no diminu-

tion of sexual potency or desire. Some five years following, however, there was a return of active motile spermatozoa and a vasectomy was performed a little later. Dr. Granger also cited another record of a case which after eighteen months had shown no change in the complete azospermia which had been effected by *x*-ray treatments. He thinks that the results already obtained hold out much encouragement in the production of sterility by the *x*-ray, and that the sterility may continue through a number of years and be compatible with perfect virility and genital competence, yet if permanent sterility is required, vasectomy is much surer than the Roentgen ray.

Dr. J. H. Selby, of Washington, D. C., demonstrated an improved Bucky diaphragm—"A New Instrument."

#### SATURDAY P. M.

On request of the Chairman, discussion in "Recent Experiences With Roentgen Therapy" was opened by Dr. A. F. Holding, who demonstrated Dr. Corbett's modification of the Lovibaud tintometer adapted for measurement of *x*-ray dosage with pastilles. He called attention to the fact that that instrument excelled the Sabouraud noire pastilles, Kienbock, Holz knecht, Hampson and other roentgenometers, because (1) the standards were glass, not subject to deterioration or variation; (2) these standards absolutely matched the measuring pastilles in color, surface and texture; (3) the background for observing the colors was absolutely black and therefore did not distract the observer's eye; (4) of the freedom from delay, from fuss and muss of developing strips for a fixed time at a fixed temperature. He stated that in extremely malignant cases he was able to administer, with noticeably better therapeutic results, the following dosages to deep-seated tumors, without material damage to the skin:  $3\frac{1}{5}$  B. tint = 14 Hampson =  $17\frac{1}{2}$  Holz knecht = 35x Kienbock.

Dr. G. E. Pfahler considered this an heroic dosage, and liable to result in dangerous skin effects later, and warned against the danger of publishing or using such dosages. He gave the dosage he considered effectual and safe. Bad systematic effects were often noted when high voltages were used, especially nausea and vomiting.

Dr. Holding thought this nausea and vomiting was due to the inhalation of ionized and ozonized air, which nauseated from its odor, and was not an *x*-ray effect. He said he controlled this by ventilation, not by diminishing the *x*-ray dosage.

Dr. J. T. Case gave the dosages he employed. The three tables of dosage using the Coolidge tube are appended.

	Parallel Sp. Gap Between Points.	Filters mm. Alum.	Leather Sole.	Focus— Skin Dist.	Milmp.	Time Min.	Milmp. Min.	x. Kienbock.
Holding . . . . .	10"	3	1	6"	7	3	21	30
Pfahler. . . . .	9"	3	1	8"	5	5	25	20
Case . . . . .	9"	4	..	7"	6	3	18	18



Dr. E. W. Caldwell made a working drawing of the way he protected his patients from the rays and drew off the ionized air from around his tube by connecting a special made tube box to a 'Sturtevant Horse Cleaner' used for suction. He also wished to know how Dr. Holding had come to select a 10" spark gap. His experience led him to favor an 8" spark gap.

Dr. Johnston asked several technical questions as to impulses, wave formation, etc., stating that he thought the large dosages given by a 60 cycle machine did not mean as much actual energy output as a 120 cycle machine.

Prof. Shearer said that measurements by milliampèremeters *on the machines* were greater than when taken *at the terminals of the tubes*; the latter was the only reliable place to make the measurements, as there was much leakage from the wires, especially if they extended a long distance before reaching the tubes. He called attention to the variation of length of parallel spark gap, according to whether they were measured between two points, according to the size and shape of these two points, and between balls, according to the size of the balls, and suggested that Dr. Coolidge could give expert information on this point.

Dr. W. D. Coolidge favored the use of a voltmeter in the primary circuit (instead of the parallel spark gap) to estimate voltages in the secondary current. He anticipated that the time would soon come when we could measure all these details by actual electrical units which would displace all present and inaccurate radio-chromatic approximations.

Dr. E. C. Titus described a method of measurement by the use of carbon units of uniform resistance.

Dr. A. Howard Pirie said that on computation Dr. Holding's dosage and Dr. Pfahler's did not materially differ, except that Dr. Holding used a 10" spark gap and Dr. Pfahler used a 9" spark gap.

The discussion was further carried on by Drs. Samuel Stern and B. C. Darling.

Dr. Holding, in closing the discussion, said that in opening the discussion he had called attention to the 'tintometer' as the most excellent instrument he knew of for measuring dosages, but that the discussion had quite inadvertently centred about the Coolidge tube dosage in deep Roentgen therapy. He explained that it might be proved that the pastille measurements that were standardized with a tube reading 8 Benoist would not be accurate for application to *x*-rays delivered from a Coolidge tube of higher penetrations. He also explained that these heavy dosages he had employed only in hopeless cases and that in these cases for six months he had strictly limited his dosages to a maximum of 3 B. (30x Kienbock, estimated), and during that time had produced no deleterious skin effects. At the demand of materialistic scientific collaborators, who were sceptical that their patients were getting heavy doses of *x*-rays unless they could see 'burns,' he cautiously increased the dosage  $\frac{1}{4}$  B. at a treatment, and found that at  $3\frac{1}{2}$  B. he got decided erythemas, and that at 4 B. he got burns. The figures were not advisable to be generally adopted, but in his own laboratory, in his own hands, he felt that he was justified in administering these heroic doses in selected and hopeless cases. The reason he selected a 10". Parallel spark gap was because he was trying to get as many gamma rays as he could. With a 10" gap



it was estimated by Dr. Coolidge that we got gamma rays equal to those produced by radium A and radium B, and 10" was the maximum spark gap Dr. Coolidge had built his tubes to back up. Just as soon as Dr. Coolidge would give him a tube that would back up a parallel spark gap of 20" he was going to try to produce gamma rays of a penetration equivalent to the most penetrating gamma rays of radium C. Then he expected to be able to administer proportionately larger doses with corresponding better effects.

Dr. Coolidge was called upon to open the discussion on the "Coolidge Tube." He stated among other interesting things that a filter of aluminum, 15 in. thick, filters out 85 per cent. of the *x*-rays passing through it; also that a good thick lead glass bowl, as sold by reputable *x*-ray firms, cuts out 99 per cent. of the *x*-rays generated by any *x*-ray tube excited therein.

Discussion continued by Drs. Snook, Coolidge and Caldwell.

Dr. Johnston wished to hear concerning safety devices for the use of the Coolidge tube, and described how he had found that in order to make it safe to use the Coolidge tube on his modification of the Cole table, he had to protect the opening where the plates were inserted by using refrigerator doors.

Dr. Holding explained how the same thing could be accomplished better with an ordinary window casing and counterweighted lead protected sash, which would not only protect the roentgenologist, but also automatically hold the plate and screen in place.

Dr. Cole said that this matter was all covered in the original published descriptions of his table, and the reason men were having difficulty with their tables was because they were making modifications of the Cole table, which got them into trouble. If they would get the real Cole table, they would have no trouble.

#### SATURDAY EVENING.

Lantern slides shown by Dr. J. T. Case (gall-stones, appendix, bone pathology); Dr. D. R. Bowen; Dr. I. S. Hirsch (bone tumors); Dr. F. H. Baetjer; Dr. W. H. Stewart; Dr. G. E. Pfahler (one case of carcinoma of the stomach—ten slides); stomach lesion for diagnosis; fracture of petrous portion of temporal bone.

Dr. L. T. LeWald (stereoscopic projections of roentgenograms by development in complementary green and red tones); syphilis of stomach; pre-operative Roentgen urological examinations; reconstruction of the colon; the gall-stone problem; etiology of cardiospasm.

Dr. A. S. Unger, Dr. B. C. Darling (dental pathology).

Dr. A. Bassler (esophageal, stomach and colon cases).

Dr. W. H. Stewart, Chairman of the Committee on the "Roentgenologist as a Consultant," reported that the Committee recommended the following 'principles' for discussion in open meeting. The subject naturally divides itself into (1) the consultant-roentgenologist's relation to the physician referring the case, including the Roentgen report; (2) the consultant-roentgenologist's relation to the patient. No fixed rules could be adopted, as localities, personalities, and clientele vary widely. The consultant-roentgenologist's report should be written, and it is advisable to divide it into two parts: (a) A statement of the Roentgen findings; (b) con-

clusions drawn exclusively from Roentgen findings and a diagnosis if possible.

No recommendations as to treatment should be volunteered unless asked for. The routine distribution of photographic reproductions should be discouraged.

The consultant-roentgenologist's relations to the patient. No report should be given to the patient directly, but indirectly through the physician referring the case.

#### THE EXHIBITORS.

Eastman Kodak Company, Rochester, N. Y., exhibited a collection of color process plates on individual illuminating boxes, showing various skin lesions.

Wappler Electric Manufacturing Company, New York, exhibited their transformer heating unit for regulating Coolidge tubes without the use of storage batteries. Also a graduated parallel spark gap.

Snook-Roentgen Manufacturing Company exhibited a polyphase transformer for generating *x*-ray currents. This was operated for a new style insulated switch-stand control, set at such an angle and so constructed that it is absolutely impossible to get a shock from it. On this was mounted a voltmeter in the primary circuit graduated in inches to gauge penetration and voltages. The Snook hydrogen *x*-ray tube, with devices for lowering and raising its vacuum, was also demonstrated.

Scheidel Western Electrical Company exhibited Coolidge tube outfits with batteries and insulated battery stands.

## SIMPLE ROENTGEN ACCESSORIES.

The following devices serve to fix certain joints in definite standard positions. They can be easily made out of plain lumber and stained in oak or mahogany or be white enameled.

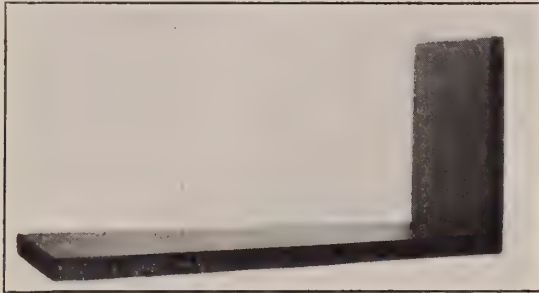


Fig. 1.



Fig. 2.

## ANTEROPOSTERIOR ANKLE SUPPORT.

To one end of an inch board about 5 in. wide and 18 in. long is attached at a right angle another similar board 8 in. long (Fig. 1). Small  $\frac{1}{2}$  in. angle-irons may be attached to fix the boards permanently in addition to the usual screws or nails.



This device is used in the manner shown in Fig. 2 to obtain the anteroposterior view of the ankle-joint. A heavy rubber band is placed about the toes and the upright board to maintain the position of the foot and limit any motion on the part of the patient.

The tube should be focused at a point upon the anterior surface of the tibia midway between the external and internal malleolus. The plate is placed posterior to the ankle and rests flat upon the long posterior board. Plates 5x7 in size are large enough for this exposure.

It sometimes happens that the knee of the affected limb cannot be fully extended without pain, and in this event it is well to place the wooden angle-pillow, which is supplied by many manufacturers with their tables, under the long posterior board to accom-

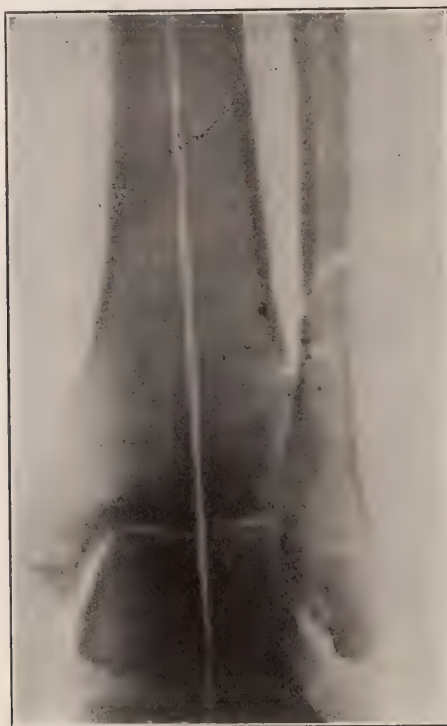


Fig. 3.

modate the slightly flexed knee. This is illustrated in Fig. 2 also. This does not interfere with the adjustment of the foot to the upright board as above described, but it necessitates changing the angle of the tube holder so that the horizontal plane of the tube is parallel to the Roentgen plate.

The resulting anteroposterior ankle negative gives a good impression of the ankle mortise. In the normal ankle the articulating surface of the astragalus will be transverse to the long axis of the leg, and a line drawn down the centre of the tibial shadow will divide the shadow of the astragalus equally (Fig. 3).

In the reduction of fractures at the ankle one should aim to replace the astragalus beneath the tibia so that the ankle mortise

is restored and so that the line of weight-bearing force is re-established. It must be remembered that the weight of the body is transferred through the tibia to the foot by means of this broad superior articulating surface of the astragalus.



Fig. 4.



Fig. 5.

#### LATERAL WRIST SUPPORT.

This consists of a 1 in. round peg about 4 in. long which is sunk in a board about 5 in. wide and 15 in. long, near one end and at right angles to the board (Fig. 4).

This device is useful in procuring lateral exposures of the wrist. If there are no bandages on the hand, the patient rests the outer surface of the forearm upon the board and grasps the round peg (Fig. 5). If there are bandages, the anterior splint is brought in contact with the peg, and a light sandbag placed against the back of the hand maintains the lateral position.

The tube is focused above the styloid process of the lower end of the radius. The resulting Roentgen negative necessarily offers the confusion of the radial shadows superimposed upon the shadows of the ulna. A most important interpretation shadow in Colle's fractures is the articulating surface of the lower end of the radius. In the normal wrist, this articulating surface between the radius and the carpal bones presents a plane not at right angle to the long axis of the forearm, but at an acute angle

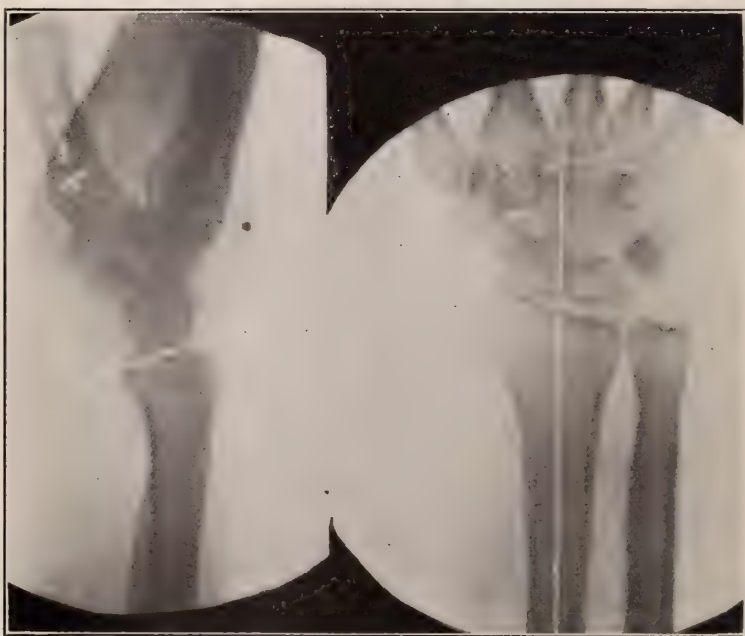


Fig. 6.

with the lower point toward the posterior dorsal surface of the hand (Fig. 6).

In the reduction of fractures at the lower end of the radius one should seek to restore this articulating surface of the radius to the normal angle described above. It is the secret of good functioning results. The anteroposterior Roentgen view of the wrist is deceptive unless certain definite mathematical calculations are applied. But if each reduced Colle's fracture is tested by the aforementioned lateral Roentgen exposure there will be less fault to find.

#### KNEE TUNNEL.

There is some awkwardness in making lateral exposures of the knee when the external surface of the knee is placed in position



upon a plate because of the inability to arrange the other leg comfortably and out of the way.

A sort of tunnel may be constructed with one board about 10 in. wide and 18 in. long, to the long edges of which are attached two boards of equal length and about 6 in. wide (Fig. 7).

The tunnel is placed over the sound limb and the injured limb is then placed upon the top of the tunnel as the patient rolls upon the side. The Roentgen plate is placed on the flat surface of the

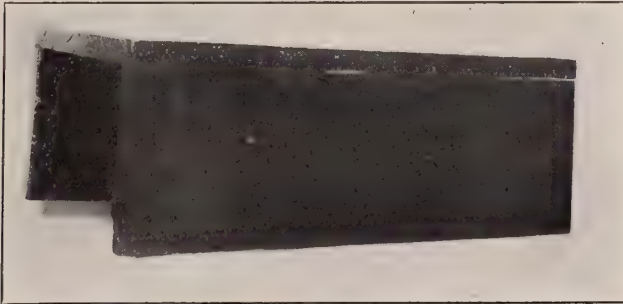


Fig. 7.

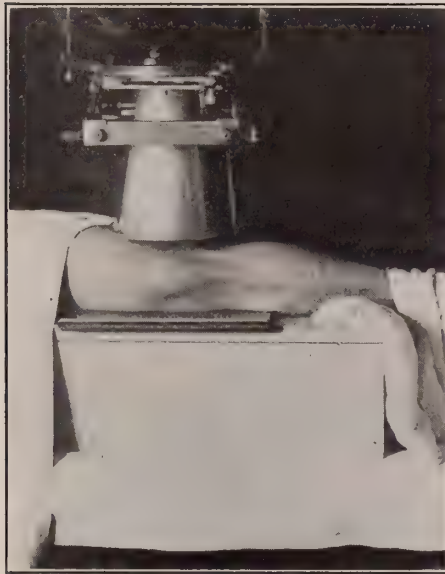


Fig. 8.

tunnel under the injured knee, and the exposure becomes an external-internal view of the knee-joint. A good focus point is about 1 in. above the head of the fibula, which is subcutaneous (Fig. 8).

This tunnel also is useful in making lateral exposures of the thigh, leg and ankle. The patient is very comfortable if a thin cotton pad is placed between the leg and the lower end of the tunnel.

Lateral stereoscopic exposures of the knee may be made with this tunnel if a Bowen aluminum envelope is inserted between the knee and the tunnel.

To obtain the correct lateral adaptation of the knee to this tunnel it is necessary for the patient to roll upon the side so completely that he cannot witness the exposure. A broad sandbagged strap across the hips helps to maintain position, as does also a small sandbag upon the lower leg.

If one has never used such a tunnel, one will be agreeably surprised by its usefulness and comfort to the patient.

## DARK-ROOM HINTS.

Does it ever occur to the Roentgen worker, who is attempting to economize, that dark-room solutions are the cheapest items in laboratory expenses?

Yet it is usually the old solutions and the dirty, unfiltered mixtures to which many failures are due. It is far more economical to make every exposed plate into a clean, well-developed negative rather than to be forced to the expense and embarrassment of repeated exposures, because of false ideas in dark-room economy.

The prevalent mania for short exposures leads to under-exposure, which in turn demands a longer development with the stains and fogging incident thereto. Certain chemical stains arise from the development in old solutions. Chemical fog may occur from prolonged development.

Frequently chemical stains are due to deficient amount of sulphite in the developer. Two formulas are recommended to eliminate these chemical stains.

Aagaard (*Am. Quart. of Roent.*, Vol. V, No. 1, p. 20) offers the following method and formula:—

“*Solution A*—One ounce of saturated solution of potassium permanganate in 8 oz. water;

“*Solution B*—One ounce of potassium metabisulphate in 8 oz. water.

“The roentgenogram to be treated must be washed thoroughly until it is free from hypo. If it has been dried, it should be soaked up again. Two trays are required, one for each solution.

“Immerse the plate in *Solution A* for four or five minutes, agitating the solution constantly by rocking the tray. Then remove the plate and rinse it well. On removing the plate and rinsing it, it will be found stained the characteristic color of permanganate, but after being left in *Solution B* from two to three minutes, and again rinsed, it will be found perfectly clear. It is very important that the surface of the plate should be rubbed with a tuft of cotton dipped in water after being removed from *Solution A* and before it is placed in *Solution B*, to be sure that all the chemicals are removed from the film, otherwise some stain may be left.

“If the negative is especially discolored, the stain may not all be removed by the first treatment. After washing the plates for about thirty minutes in running water in the usual manner, the treatment may be repeated with success. This process does not soften the film, as the potassium metabisulphate is a well-known hardener for fixing baths.”

An under-exposed plate will develop slowly, and without detail in the bony or soft tissue. The plate will not improve by protracted immersion in the developer and the gain in density will be negligible. An attempt to force development of an under-exposed plate by the use of a strong developing solution will always result in failure.



## EPITOME OF CURRENT ROENTGENOLOGICAL LITERATURE.

Hour-Glass Stomach.—Holland (*Medical Circular*, 1914) believes that the *x*-ray method of examination of the living and functioning stomach has revolutionized our previous ideas of this organ as based upon (a) ordinary methods of clinical examination, (b) post-mortem and dissecting-room appearances, (c) operation appearances. But he nevertheless maintains that the history of the case and the experience of the skilled physician or surgeon are just as essential for correct diagnosis as they ever were. An *x*-ray examination alone, without any knowledge whatever of the patient or the history of the case, may demonstrate beyond all doubt the stomach lesion which is present, and this is almost without exception the case when an hour-glass condition of the stomach is present. Holland makes the examination with the patient in the standing position and facing the screen. His routine meal is a half pint of bread and milk made of the consistence of thick bread sauce; into this he stirs 3 oz. barium sulphate, and sweetens with a little soft sugar. The patient is gradually fed with this and the stomach appearance is watched. In a typical case the food gradually fills up what is obviously an upper portion of the stomach; when this is full, the lower end is seen to be somewhat rounded, and although this is not invariably the case, it may gradually taper down to a point, and just to the median line of the lower end a small tag of bismuth will turn inward and downward. At this point it is possible that food may be extruded into a little blob, *i. e.*, into the cavity of an old ulcer, and above this may be a small collection of gas showing as a more transparent area. Watching the constriction, the food more or less slowly and gradually passes down, and, according to the rate at which it passes, fills up the lower compartment of the stomach. The food passes from the upper to the lower sac by gravity; rarely are any definite contractions seen in the upper sac. In the lower sac it is different. Here, directly enough food has collected, the ordinary rhythmic stomach contractions are in evidence, and if there is no pyloric obstruction, the normal rhythm of the pyloric end is seen passing into and through the duodenum. Generally it is possible from the appearance of these contractions, and from the other signs, to say whether there is definite pyloric obstruction in addition. While this is the typical appearance, many variations occur, depending upon (1) the size of the upper sac, (2) the size of the constriction, (3) whether or not an ulcer cavity fills up, and, if so, its size and shape, and whether there are adhesions to neighboring organs, (4) the condition of the sac, (5) the presence or otherwise of pyloric obstruction, (6) the presence of adhesions.

Holland says that from a purely diagnostic point of view the taking of a plate or plates is unnecessary; but, on the other hand, these give a permanent record of the *x*-ray findings which is very convincing, and they often show minor points and details which

at any rate are of interest, and are often of value in deciding upon the operative technique. In less typical cases there are certain possibilities of error which must be guarded against: (1) in *gastroptosis* the stomach is much elongated; food on entering collects in the cardiac end, extends downwards in a straight and more or less thin line, and then fills up the lower portion of the stomach. The appearance of an hour-glass constriction is thus simulated by the drawing out and drawing together of the central portion of the stomach surfaces. No error of diagnosis should arise in this condition, and (a) the manual pressing up of the food and lower part of the stomach as seen on the screen, and (b) the examination of the patient in the lying-down position, will at once obviate any possibility of making a mistake. (2) *Malignant disease* may at rare times give rise to appearances simulating hour-glass constriction from old ulceration; but in these cases the disease will probably cause other alterations in the shape of the food shadow, which will at once lead to suspicion, and the more rapid onset of symptoms and the history of the case will point to the cause. (3) *Pressure from distended large bowel* will cause the food shadow to simulate an hour-glass constriction, or may mask the latter. This may be so great as to cause the appearance of hour-glass in an otherwise normal stomach, and it may mask the appearance in a typical case so much as to cause error unless great care is taken. (4) *A small active ulcer on the lesser curvature and spasm* may be considered together. The former may set up spasmodic contraction, or spasmodic contraction may be present alone (reflex) without any definite stomach lesion. When the bismuth outline of the stomach is sharply divided into an upper and a lower sac, great care in differentiating is necessary. Sometimes (1) massage of the stomach will clear up the diagnosis; under this massage spasm will often relax and the constriction will disappear; (2) pressing the food upwards from the lower part will at times in spasm open up the apparent constriction; and (3) at a second examination made on another occasion the spasm may not be present. In Holland's series of 34 cases, there were 32 females and 2 males. In discussing the question as to whether cancer often supervenes upon an old chronic ulcer, Holland believes that the experience of these cases at any rate suggests that this statement must be accepted with some reserve. Previous to the advent of the Roentgen rays, hour-glass constriction of the stomach had been a comparatively rare one. It is now obvious that this idea requires revision. The 34 cases referred to in this paper occurred within three years, and although the actual percentage to the total number of cases examined may be small, nevertheless the condition has been found so frequently that it cannot be described as rare. The difficulty of clinical diagnosis is well exemplified by the following facts: Of the 34 cases, the definite diagnosis before Roentgen examination was made in one case; and curiously enough in this case the constriction was a very small one, and the upper sac easily emptied into the lower, and there was in addition almost complete pyloric constriction. The diagnosis was suggested as possible in 2 cases. In one case with the history of two operations for perforated gastric ulcer, symptoms recurring, the *x-ray* examination was made to see if hour-glass constriction was commencing. In the remaining 30 cases the papers sent to the *x-ray*



department with the case, when an examination is required, suggested as possible a large number of different conditions, and in some no diagnosis at all. In conclusion, Holland states that he should point out again that first, an *x-ray* examination is diagnostic as to the presence of the constriction; second, it can show the remarkable accuracy of the size and shape of the two sacs; third, the rate at which food can pass from the upper to the lower sacs; fourth, the presence of an old ulcer cavity; fifth, very frequently the absence of a pyloric obstruction. Yet there are certain things which it cannot always do, and one of these is that it is not possible definitely to exclude the possibility of malignant diseases in addition.

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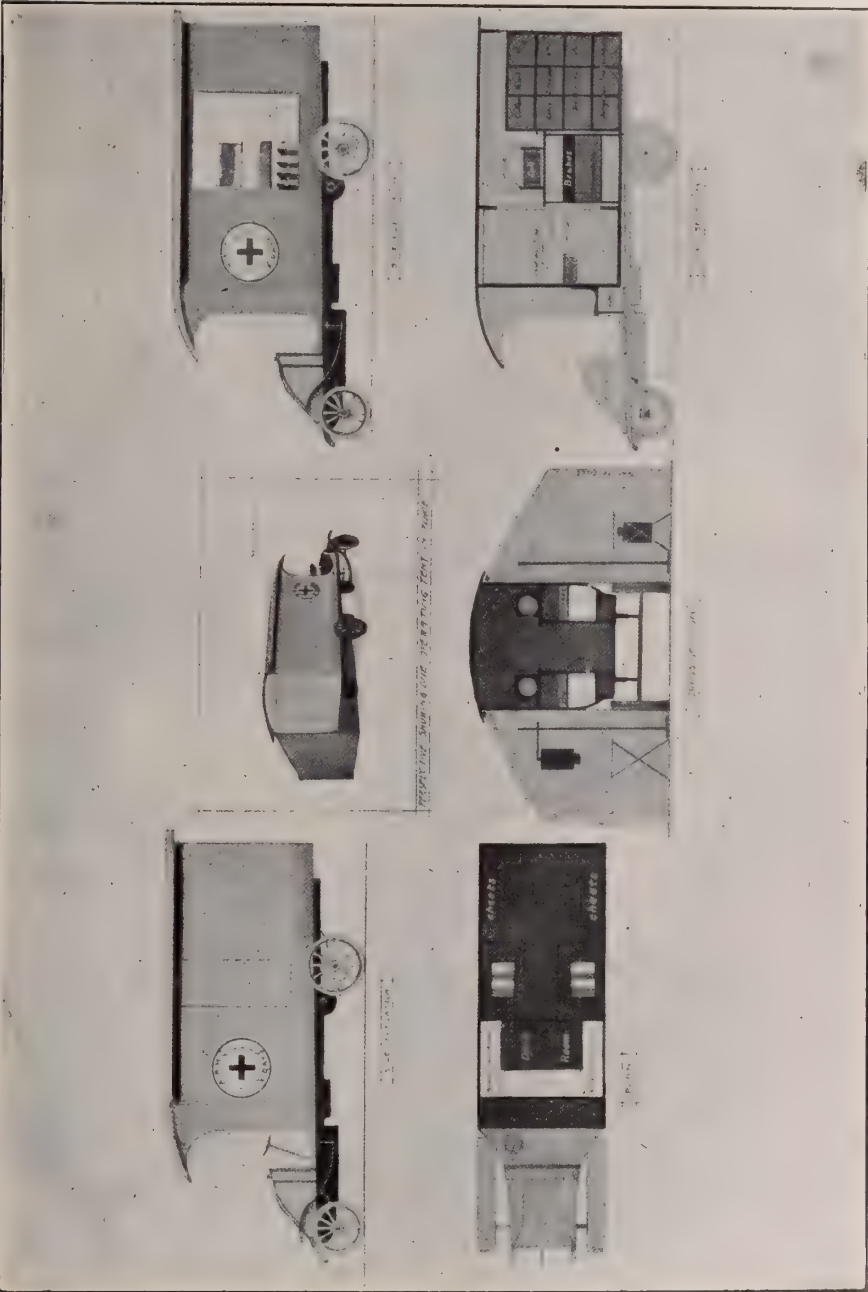
X-Ray in War.—Lemon (*Arch. Roent. Ray*, 1914, Vol. 19, p. 200) has worked out in detail and designed a complete *x-ray* outfit for work in the field at the seat of war. It consists of a 35 horse power motor car whose body is strongly yet lightly built of steel on a chassis capable of carrying 4 tons. The body is 8 ft. high by 8 ft. wide and 12 ft. long inside. A 150 volt dynamo is driven from the engine and furnishes electric lights for all purposes. Four sets of accumulators, each capable of carrying 70 volts of 60 amp. hour capacity, are used in the production of the *x-ray*. The front third of the car is divided into two dark-rooms of equal size, each room containing a 100 gallon tank, one for gasoline and one for water. Below the tanks are lined cupboard shelves for the *x-ray* plates, the top of which cupboard forms a shelf of 6 in. for the reagents. The rooms are lighted at night by a ruby light and by day from a ruby window in the front of the room. The developing trays are just behind the driver's seat where the water can be drawn directly into them. Behind the dark-rooms on each side are complete *x-ray* outfits, at the foot of each is a set of accumulators capable of supplying 70 volts; on the shelf above there is a Wehnelt break for instantaneous radiography, a powerful motor mercury break for screening, fluoroscope lined with lead glass, a tube of compressed gas, gloves, etc. On the top shelf is a 12 in. coil with milliampèremeter and valve tube, solidly fixed. On the outside of these stands, and facing the doors at the side of the car, are the switchboards. When the doors are opened they allow the high tension leads to pass outside. Two Watson protection tube stands, which can be lifted out of the car, are carried behind the Roentgen ray apparatus. The rest of the space is taken up with two folding tables, medicines, instruments, etc. On the outside of the car, fixed permanently under the eaves, are two 8x12 tarpaulin tents. They are dark enough for fluoroscopy.

The operating corps consists of two Roentgen surgeons, two assistants, an electrical engineer, a mechanical engineer, two photographers and four ambulance men. When traveling, four ride on the front seat, four inside, and four on the back step.

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The Roentgenological Diagnosis in Ulcus Duodeni.—Schlesinger's observations (*Deutsch. med. Wochenschr.*, 1914, No. 23) are made from material gathered from 114 cases. The diagnosis, according to his view, is often promoted by the Roentgen examination, and, what is more, the examination often brings about a





See "X-Ray in War," p. 316.

decision. He believes himself able to clear up the apparent contradictions of other Roentgen examiners. His conclusions are somewhat as follows. Only in a few cases of *ulcus duodeni* is a change in the duodenum to be seen in the Roentgen picture. More important are the secondary changes which the duodenal ulcer always produces in the stomach, and so the subject is treated with regard to reflex phenomena which still generally appear to the mind as hyperfunction. This condition is best designated as reflex excitation neurosis. Contradictions which were found are explained as a fatigue and exhaustive condition. The functional over-excitability produces certain secondary phenomena. *Primary*: Hyperperistalsis, excessive tonicity; of particular significance are excessive tonicity and pylorospasms; hypersecretion. *Secondary*: Permanent bulbus, high position upwards to the right of the pylorus during peristaltic activity; further, dilatation of *pars pylorica* and unloading toward the right over the *pars verticalis duodeni*; dilatation of the whole stomach. These anatomical changes first give to the stomach neurosis its peculiar character in *ulcus duodeni* and differentiate it from other neuroses, especially those in neurasthenia, cholelithiasis, appendicitis, etc., in which the secondary changes as a rule are absent. The differences exist, at times distinct, though generally they are only gradual and their differentiation requires careful clinical deliberation.

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Further Practical Knowledge of the Non-Operative Treatment of Cancer.—Krönig and Gauss, Krinski and Lemke, Waetjen, Königsberger (*Deutsch. med. Wochenschr.*, 1914, No. 15) treat the subject with extensive division of labor. The first two authors work up the clinical part, the next the experimental, while the histological and physical work proceeds from the last two. First of all, the question is debated whether homogeneous radiation with Roentgen or a radioactive substance be given the preference. With this in mind, searching experiments were made which proved that no preference can be given to the Roentgen rays over mesothorium. Searching examinations, physically and histologically, were made to find out why this is the case. The hard *x*-rays penetrate deeply without harm to the skin, and even in great depths (from a number of observations) the maximum dose, that is, the one still suitable to destroy permanently the cancer tissue without exciting its growth, can be used. Various new words of comparison are brought into use—*Impulsstärke*, *Impulsstunde*, *Elektroquotient*. Through their application the maximum dose for carcinoma was successfully achieved.

A searching examination is devoted to the *Filterdicke* (filter thickness) and *Abstand* (distance). Several particularly instructive cases, and also extensive metastases caused by the therapy of radiation are accurately portrayed. It appears from this that the best results of treatment are obtained when one causes the carcinoma to disappear in the shortest time possible and with the highest possible dose. Especially important are the observations that in operable carcinoma good and permanent cures were brought about. The observations prove also that the radiation treatment, as regards danger of metastasis, is more favorable when the mechanical pressing-in of swollen tissue is carried into the lymph-channels. In no case, even in the most prolonged application of

the various rays, were injuries of the general organism, particularly through the disturbance of glands with internal secretion, to be observed. The results are as follow: Those rays should be preferred which have the greatest penetrating capacity. In spite of the great progress in Roentgen technique there are still prepondering filtered gamma rays. Whether in the treatment of deep-seated cancer, the filter should be thicker or perhaps replaced by a zinc filter, has not yet been accurately proved. In mesothorium or radium the interval of distance is to be measured at least at 5 m.; nevertheless, a considerable mass not less than the equivalent of 500 mg. radium bromide should be employed, so that in the deep-seated tumors the maximum dose is always obtained. At a sufficient distance tissue injuries fail to appear. The histological examinations prove that Roentgen and mesothorium rays act on carcinoma in a like manner. The *elektroquotient* between carcinoma and normal tissue cells is in both rays so great that the normal tissue cell is generally much less easily injured than the cancerous cell. With both rays deep-seated carcinoma was brought to complete involution without noticeable injury to the healthy tissues; this fact has now been observed for a period of two years. In severe inoperable cases the radiation should be continuous, especially when the new growth can be approached with cross-fire treatment. Furthermore, the radiation is to be preferred in carcinoma which produces a high operative mortality with great recurring capacity (for instance, vulvar and vaginal carcinoma). If an operation on a cancer is demanded, then the scar must be treated with rays for at least two years, at regular intervals, to prevent a relapse.

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The Influence of Secondary Radiation on the Photographic Plate.—Bucky (Roentgen Taschenbuch, Bd. VI, p. 11) states that secondary rays arise from (1) the glass wall of Crookes tube; (2) exhibited object; (3) the photographic plate and immediate surroundings. The first are meagre and almost eliminated by Albers-Schöenberg's cylinder; in the second, conditions are less favorable, and, according to their density, have the greatest influence on the quality of picture and are decreased by means of *Wabenblende* (honey-comb blind). Against the third we are practically helpless up to the present. In ordinary photographs there are strong contrasts of light and shade, from deepest black to purest white. In the Roentgen plate there are no clear glass spots, but there is a diffused veil. The stronger the Roentgen radiation the more noticeable is the difference.

The ordinary photograph is superficial; the Roentgen, penetrating. The main cause of these appearances is the influence of the secondary rays on the photo plate. In order to draw an exact comparison, the same conditions must obtain for both pictures. For example, a thin transparent celluloid vessel with rectangular base is filled with water and a rectangular metal rod is placed in the middle. If we observe this by means of light falling through and the source of light coming from a point and so placed that we can observe the shadow picture on the screen, we see practically no shadow from the vessel and water. The metal rod



throws a sharply-outlined, intense shadow. In this picture the greater contrasts are shown between brightest light and deepest shade.

If we replace this light source with a Roentgen tube and a fluorescent screen and use the Roentgen rays, we note at once that the water casts a considerable shadow which shows that it does not transmit Roentgen rays as readily as light rays. We observe that the metal rod does not cast the intense black shadow as before, although the metal rod practically transmits no Roentgen rays. Also it has not the same sharp outline.

In order that it may not be thought that the water absorbs more Roentgen rays than light rays, we replace the water with a soluble black pigment of about a density which in light rays brings out a similar absorption, so that the shadow differences between water and rod correspond almost to that of Roentgen illumination. In this case the metal rod remains dark and sharply outlined as in the transparent picture with light rays and clear water. From that it follows that the brightening of the rod's shadow and indistinct outline is not caused by the great absorption of Roentgen rays in water. That this assumption is conclusive is proved whilst we replace the colored water with milky water. Without difficulty, similar shadow pictures are therewith produced with Roentgen rays as with light rays. Also in the milky water is seen a brightening up of the rod's shadow and a change in the sharp outline. The explanation of the phenomenon is to be found in the diffused radiation joining in, called, in roentgenology, secondary rays. These rays are all over the object, internally as well as on the surface.

This radiation is diffused and on all sides in opposition to the primary radiation, and in this way secondary rays slip in between the rod and screen and cause a brightening of the shadow and an indistinct outline of the rod. In the milky water the light rays are diffused, and the natural consequence is that the shadow picture resembles a Roentgen picture.

By this we see that the photo plates of Roentgen pictures are diffused by a veil which cannot be overcome so long as there is no means of taking away their light. If we photograph the above arrangement with milky water and the source of light coming from a point, we have a picture resembling a Roentgen picture.

The heavier or thicker the object, and the more the Roentgen radiation is turned aside, the more disturbed is the veil. When secondary rays are meagre, the parts of the plate not covered by the object are intensely black. If rays are strong, then these points appear brownish-yellow in color.

The effect of secondary rays may be compared to over-exposure of ordinary photographic plates. This assumption is conclusive, and is made clear when we eliminate secondary rays of the body by means of the honey-comb blind. Then we obtain the deep black on plates.

The secondary rays arising in the stratum of the plate must not be neglected. At present we have no means of eliminating this form of secondary rays, yet it follows from the foregoing observations that strict attention should be paid to hold the secondary rays, adjoining the medium of the plate, back as far as possible.

## BOOK REVIEWS.

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**MEDICAL ELECTRICITY, ROENTGEN RAYS AND RADIUM.** With a Practical Chapter on Phototherapy. By Sinclair Tousey, A. M., M. D., Consulting Surgeon to St. Bartholomew's Clinic, New York City. Second Edition, Thoroughly Revised and Greatly Enlarged. Containing 798 Practical Illustrations, 16 in Colors. Philadelphia and London: W. B. Saunders Company. 1915. Price, \$7.50.

It is said that by the time an encyclopedia is published it is out of date. This does not make such books useless. Their necessity is witnessed by the fact that publishers go on publishing them because they are sold in large numbers. No home is complete without one, and no Roentgen or electro-therapeutical laboratory is complete without its copy of Tousey.

This large volume has grown into a second and better edition. Its encyclopedic character is maintained by the addition of information upon diathermy, sinusoidal currents, intensifying screen technique, roentgentherapy, Coolidge tubes, radium therapy and, as Tousey insists, the author's method of dosage. Machado's tabular classification of electrical modalities is included.

The remarkable and extensive sale of this book is probably due to the fact that Tousey mentions everything which the title of the book infers. An important feature of such an encyclopedic effort is the index, and certainly no complaint can be entered here, because each subject and the authorities mentioned are indexed and cross-indexed to such an extent that it is a librarian's delight.

One is forced to realize after perusing this gigantic book that Tousey is one of the great electro-therapeutists and roentgenologists of the world. Original and pioneer effort is recorded upon almost every page. It is fortunate that the author chose to make his major opus an encyclopedia, otherwise his original work would have made only a 500-page octavo volume of reasonable price. It is rare, nowadays, to find authors content to be editors of encyclopedias. But then this book is mostly Tousey, so why should not he style himself the author?

The author's methods, original devices, and pioneer technical tricks are well described and amply illustrated. It is remarkable that they are not more generally used in the laboratories of America and abroad.

The book is recommended for its encyclopedic advantages and its excellent index.

**X-RAYS.** An Introduction to the Study of Röntgen Rays. By G. W. C. Kaye, B. A., D. Sc., Head of the Radium Department at the National Physical Laboratory, etc. etc. New York: Longmans, Green and Company. 1914. Price, \$1.75.

This book is one of the best that has ever appeared upon the *x*-ray. A superficial glance gives the impression that it is extremely deep because of the frequent appearance of mathematical equations, but the more careful reading proves that it is decidedly understandable. It is distinctly a book for students of the Roentgen ray. The first chapter contains a description of the phenomena taking place in the Roentgen tube and discusses the electron theory of matter. The major portion of the book is taken up by a very full description upon the physics of roentgenology, but there are also chapters upon the technique of radiography and radiotherapy, and most satisfactory chapters upon the measurement of the *x*-ray, upon secondary rays and the physiological and curative action of the latter two. The last chapter is devoted to recent experimental Roentgen work, especially the interference and reflection of the Roentgen ray.

The most interesting feature of the book is a little story of the interview with Roentgen himself, relating to his discovery of the *x*-ray. This is worthy of a very important place in Roentgen literature. We recommend the book most highly.

**THE ALIMENTARY TRACT.** A Radiographic Study. By Alfred E. Barclay, M. A., M. D., B. C. (Cantab.), M. R. C. S., L. R. C. P., Medical Officer to the X-Ray and Electrical Departments of the Manchester Royal Infirmary, etc. etc. New York: The Macmillan Company. 1915. Price, \$4.00.

Those physicians who are known as general practitioners, but who in many instances have to exercise their judgment in connection with obscure dis-



turbances, just as does the specialist, should not forego reading this excellent book on the alimentary tract if they wish to know how best to clear up points that might stand in the way of a correct understandingness of a case. The x-ray as a means of diagnosis, especially in alimentary diseases, is so important at the present time, so illuminating and so sure a method, that to neglect its beneficent help in making a diagnosis is a neglect that invites the most caustic criticism. The author in some 140 pages brings out these points in a most intelligent manner and with a clarity that must make apparent to every reader the value of this means of diagnosis. That a second edition of the little volume which was really a thesis submitted for the degree of M. D. at Cambridge, in April, 1912, is now before us in its augmented form, speaks volumes for its good points and its kindly reception on its first appearance. Here, indeed, is no book bristling with technicalities or obscure phrases, but one that one can read without any great mental strain, but with far better results than accrue from wading through pages turgid with quotations from authorities, mostly of a controversial nature.

**THE ROENTGEN RAYS IN MEDICAL WORK.** By David Walsh, M. D., Ed., Senior Physician, Western Skin Hospital, London, W.; Hon. Physician and Senior Physician to the Skin Department, Kensington General Hospital, etc. etc. Part I—The Electrical Apparatus. By H. Lewis Jones, M. D. Cantab., F. R. C. P. Lond., Medical Officer in Charge of the Electrical Department, St. Bartholomew's Hospital. Part II—Medical and Surgical. By the Author. Fourth Edition. New York: William Wood and Company. 1915. Price, \$4.00.

While this book has been off the press for several years, it still will profit anyone doing Roentgen work to read it. Especially commendable are the chapters on fractures. This last edition is thoroughly revised and enlarged by the addition of many splendid roentgenograms.

The chapters on electrical apparatus are by Dr. Lewis Jones, and the medical and surgical Roentgen chapters by Dr. David Walsh.

The chapters on fractures contain much experimental work on distortion shadows and their influence on the interpretation of fractures.

The literary style is so easy and smooth that the reader hesitates to lay the book aside. The surgical importance of Roentgen interpretation is incorporated in the text with rare skill. The use of a similar style in contemporary Roentgen reports would be welcomed, and therefore this book is recommended to many roentgenologists who may feel that their work is far superior to the illustrations in this book.

**GRUNDRISSE DER GESAMTEN ROENTGENDIAGNOSTIK INNERER KRANKHEITEN FUER AERZTE UND STUDIERENDE.** Von Dr. Fritz Munk, Assistant der II. medizin. Klinik der Kgl. Charité, Berlin. Mit 155 Abbildungen. Leipzig: Verlag von Georg Thieme. 1914. Price, 7.50 m.

This neat textbook upon the roentgenology of internal medicine portrays the enormous experience of the author in the application of the roentgen ray, both fluoroscopically and radiographically, in thoracic and abdominal diagnosis. There are many references to authoritative articles in contemporary roentgen journals. The illustrations are hardly up to present American standards and there is little if any mention of other than continental roentgenologists. Such a book as this in the English language would be of great educational value in America. To the American roentgenologist who follows the German journals there will be little of interest in this book. It would, however, be a good model for an American author or for translation with editorial additions from American roentgenology.

**THE CHEMISTRY OF THE RADIO-ELEMENTS.** Part II. The Radio-Elements and the Periodic Law. By Frederick Soddy, F. R. S., Lecturer in Physical Chemistry and Radioactivity in the University of Glasgow. New York: Longmans, Green and Company. 1914. Price, 60 cents.

"The Chemistry of the Radio-Elements," Part I, was published in 1911. Part II contains a more conclusive understanding of Soddy's views as to the chemical position of the radio-elements. Soddy holds that each radio-element may be regarded as a chemical analogue of some other element with which it is chemically identical. This generalization reduces the number of radio-elements into about ten groups. This small book is really one for the pure scientist, but probably the more practical man will also note with interest how the study of radio-activity has led to the discovery of elements which fill almost all those mysterious gaps in the periodic table.



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## EDITORIAL.

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### "ON THE INHERENT SPIRIT OF MEDICINE."

No doubt you, as the every-day sort of physician, have thought of yourself only in the light of a scientific man and when accused of commercialism have resented the charge with heat. You may, in extenuation of your sins, have cited some of your friends who were so blatantly commercial that by comparison you shone with a virginal effulgence. Of course, comparisons are always helpful to the individual who wants to exonerate himself, just as they are helpful when we are told we are either too fat or too thin, too parsimonious or too extravagant. But in the case of the physician, who has been ensnared by the fascinations of commercialism, to say that a number of men in his vicinage are even worse offenders than he, is not making out a clean ticket for himself by any means; it is only pointing out that others have been bitten with the disease, hence he is not alone and should not be too severely taken to task. This reasoning, if it can be called by this dignified term, we have heard many times; but even when it is strengthened by arguments, whose crown of crowns is that medicine without the commercial side will soon drive the physician into the poor house, it is wrong, for once let the medical man get this idea into his head then the ignis fatuus will lead him so merry a dance that all the other aims of medicine will be forgotten. Let us remember that it is not always the quack whose squawk betrays this lustful pursuit; if it were he, and no one else, we could point the finger of scorn at him without incurring criticism. Let us remember that nice young men and, for that matter, nice old men, men who talk gracefully and almost convincingly on the ill effects of too great an admiration for money, men who frown down the slightest insinuation that they are not alluring ornaments of the medical profession, are often just as guilty as the quack, and much more to be criticized, for their manner of thinking should be on a higher plane. That there are some of these instances in the ranks of medicine is to be deplored; and though it can be said in all truth that their number is fortunately still of a minority that might be

considered negligible, the critic in his kindest mood should not overlook the fact that the teachings of this class of men have a persuasive power that is high irresistible. To combat the spread of tenets that must do a great deal of harm to the science of medicine should be the aim of all champions of the advantages of cleanly thought; and nothing that has been written of late on this highly interesting subject has the strength of phrase that characterizes the essay from Dr. A. Stuart M. Chisholm's book "Recreations of a Physician,"\* excerpts from which are printed below:—

There seems to exist in the minds of people in general, a misconception of the dignity and purpose of medicine. We have heard much of late years about mercenary medicine, and the charge is found on investigation to be hoary with antiquity. Yet it seems that physicians as a body have been little careful to correct this error, in some cases have silently acknowledged its truth, and indeed in a few instances have apparently adopted it as a rule of professional conduct, which has further emphasized its prevalence in the minds of the laity. I have recently come across an item in a medical journal, which is especially illustrative of the virulence of this charge. In a casual clipping, the journal I speak of reports the following scholarly invective, as uttered from a pulpit in a neighboring city:—

"It is not a profession, it is a trade that the doctors ply to-day. It is not the practitioner of a profession who goes into a household and demands his fee of \$500 or \$1000 before he will apply the knife to the cancer, the anesthetic to the wound. Such practices ought to be condemned from every pulpit—every rostrum in the land. The government ought to step in and prevent them."

I am myself of the opinion that to apply the anesthetic to the wound is not good surgery, and I am convinced that such coarse accusations as these the profession of medicine throws aside like dewdrops from the lion's mane, yet underneath this vulgar and slovenly violence lurks a manifest malice which wilfully misrepresents the inherent spirit of medicine, and which, with less bitterness and better taste, prevails widely among men intelligent enough to comprehend their error when it is made apparent to them, and just enough to yield recognition to the truth when once that truth is vindicated.

I am conscious that there would be a certain presumption in my venturing to give form to thoughts that must often have come vaguely into the minds of many thinking men, were it not that while the utterance of these thoughts may be imperfect, yet it seems best that some form should be given to them, and the magnanimous spirit of our calling should be impressed upon the minds of those who have never carefully considered what the profession of medicine really is, and thus elevate their appreciation of the work we do and the ends we serve.

If the practice of medicine were, like other occupations, prosecuted for the sake of money, how many and how great opportunities for enrichment occur, may be conjectured by an estimate of the amount of money that Von Behring, for example, might have de-

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\*New York: G. P. Putnam's Sons. 1914.

manded for the use of the diphtheria antitoxin. The history of medicine is unfortunately not absolutely free from instances where the desire for gain has blinded physicians to any higher purpose. In the early part of the seventeenth century, the obstetric forceps, one of the most useful of all instruments, was invented by Peter Chamberlain, of London, but was kept as a family secret for many years for private gain. The use of this instrument was restricted to his sons and a few other persons, as Dr. Davis tells us, who also were pledged to secrecy. Nearly a century afterwards, in 1721, Palfyn invented a similar but less perfect instrument, and exhibited it before the Paris Académie des Sciences as something perfectly new, so well had Chamberlain's secret been kept. Gerard, in his "Strafford's Letters," says under the year 1634:—

"Dr. Chamberlayne, the man midwife, endeavored to erect a lecture of midwifery, which he would have read in his house to the licensed midwives of London, for which he was to have one shilling for every child born in the city and suburbs of London; other conditions he subjoined to this, as bargaining beforehand for his fees in cases of necessity—(I presume he meant 'of destitution,') but it would receive no passage from the Bishop of London, who licenses all the midwives of London, nor yet from the College of Physicians."

It is an evidence of the prevalent spirit of the profession that this case stands out as such a rarity in medical annals. The absence of cupidity among physicians is the more remarkable since the assumption of their duties is in no way restricted to selected aspirants. Young men, with no regard to fitness, embark upon its study from diverse and often from unworthy, or at least uncertain, motives, yet the inherent spirit of medicine at length influences their lives and elevates their aims in life.

Those misguided individuals have a very distorted conception of the spirit of medicine who have clamored for legislative enactments which would give to physicians the right to terminate by anticipation the lives of patients afflicted with incurable diseases; for the time can never arrive, so long as medicine continues to be a profession, when to the other duties of the physician will be added that of serving, under any conceivable circumstances, as public executioner.

So little is the beneficent purpose of medicine understood, that the profession encounters some of its most determined opposition among the very persons whom it endeavors to protect from disease. To an unprejudiced observer nothing can be more certain than that vaccination secured immunity from smallpox, yet, with an effrontery perhaps unparalleled in the history of illogical vagaries, there is in existence an active association whose purpose is to prevent vaccination. If these people were not destitute of intelligence, they would shrink appalled from the consequences that would follow the success of their nefarious propaganda. More recently, another society has been revived, that of the anti-vivisectionists, which, encouraged by the notoriety that the opponents of vaccination have achieved, has presumed to obstruct the progress of preventive medicine by an appeal to hysterical sentimentalism. The one seeks to obliterate the record of the past, the other strives to close the door to the future; both are interesting studies in mental obliquity.



The study of medicine is an entrancing subject; its practice requires an array of virtues whose mere contemplation staggers the mind. One must meet violence with gentleness, ingratitude with equanimity, insult with fortitude, slander with silence. The physician's life is a daily exemplification of the Golden Rule. The very sensitiveness that inspires sympathy with pain and misery is a weapon in the hands of ignorance and malice wherewith they deal dreadful wounds, wounds which must be endured silently. Resentment can have no place in the physician's mind. Equanimity must be maintained in the face of misapprehension and abuse.

Those physicians who practise medicine for their fees only have missed the spirit of their profession. They are hucksters and tradesmen. Among them are those who advertise their cures, who magnify their skill, who vaunt their knowledge, who promise things beyond their ken, who affect an overpowering dignity of deportment, and who exact the uttermost farthing. These are they who gain repute by disparaging their colleagues, who increase their clientele by indulging in a covert sneer at their fellow practitioners, by discrediting their diagnoses and by criticizing their treatment. There are many insidious methods of assailing and even of destroying the reputation of others. Of these unworthy members of the profession I have no wish to speak save by a passing word. Men with paltry aims, selfish lives, and ignoble minds may be found among all classes and in all callings. To those who feel and appreciate the sacred duties and the lofty responsibilities of the profession, these sordid souls are a source of wonder as well as of pity.

There seems a degrading impropriety in recognizing any possible emulation between medicine and its unworthy parasites and imitators. In several of the States there has been an annual struggle in the Legislature to obtain for osteopathy kindred recognition to that which the laws secure to the practice of medicine. Christian Science has spread, of which specious travesty of religion and medicine one may say, almost in the words of Voltaire's comment on the title of the 'Holy Roman Empire,' that it is neither Christian in its spirit nor scientific in its method. The discredited theories of Hahnemann still find a name if not a place in current speech, and optometrists have in several States been permitted to conceal their incompetence under the cloak of legislative sanction. To grosser quacks, to lower depths of pretense and fraud, to cancer-cures, to hypnotists, to abortion-mongers, to venereal quacks, I shall not so much as allude. Even their names are an offense.

Rather would I speak of those unselfish men who look upon deformity with gentle eyes and reach out to misery a helping hand; whom dirt and disease and danger cannot divert from the path of duty; to whose sympathy the cure of disease appeals as strongly as the pleasures of sense appeal to other men; physicians who, in their sacred mission, alleviate pain, comfort the distressed, encourage the hopeless, and uplift the degraded victims of sensuality and crime. All the world honors those noble men whose undaunted fortitude demonstrated the non-infectious character of yellow fever; yet they only presented on a larger stage the great principles that govern and actuate the daily conduct of the average physician. Heroism is not noted as it goes modestly on its daily rounds and performs its simple duties.

There seems to the unreflecting mind something repulsive and almost ignoble in ministering patiently to sufferers from loathsome diseases. There is a legend of St. Francis, one of the greatest of recorded men, upon which his biographers dwell with admiration, wherein he is represented as for a time devoting himself to the care of lepers, living with them, washing their sores, and gently ministering to their needs. Well, are not tuberculosis and diphtheria and yellow fever as fatal as leprosy? Yet a service that crowns Francis with a halo of sanctity and sets him apart as especially holy, fails to excite a word of admiration when it is performed daily for many years by those among us who devote their lives to such service. There is no vainglory in signaling the devoted and modest heroism that characterizes the daily lives of physicians. Perhaps it is the greatest glory of our profession, that such devotion is looked upon by the laity as usual and customary, as such an essential part of our duties, so naturally expected from us and so constantly performed, that it no longer excites comment.

An illustrious example of equanimity maintained in the face of misapprehension may be found, where so many admirable illustrations of virtue are found, in Plutarch. It happened that while Alexander the Great was in Cilicia, a short time before the great battle of Issus, he became suddenly ill after bathing in the icy waters of the Cydnus. None of his physicians dared to treat him until Philip, a physician from Acarnania, who also attended him, ventured to take the responsibility of caring for him. The extent of this responsibility may be recognized from the fact that when Hephestion died of fever at Ecbatana, the physician who attended him was crucified because the patient died. At the time when Philip assumed the charge of his illustrious patient, Parmenio wrote to Alexander to beware of Philip, for he had been bribed by Darius to kill him, and the reward that he was to receive was stated. Alexander, after reading the letter, put it under his pillow, and, Philip coming in with a draught that he had prepared, he took the cup in one hand and with the other gave Philip the letter to read, so that while Philip was reading the accusation of Parmenio, Alexander was drinking the medicine that Philip had brought him. One knows not whether to admire most the magnanimity of Alexander, or the equanimity of Philip, but both were suitably rewarded, for the illustrious patient, fortunately for Philip, recovered. One hesitates to conjecture what would have befallen Philip if Alexander had died.

It was not an unusual thing for the physician to face death when his patient died, for there was even a law in Egypt by which the physician after the third day was obliged to assume the risk of his patient's death; in which event the state avenged the patient's misfortune on the head of the physician.

These risks, fortunately for us, no longer hang over the doctor's head, but from others, no less real, we cannot escape. Everyone knows the danger that surrounds the willing ministrations of physicians. Two young physicians of my acquaintance have, within the last five years, caught tuberculosis from their patients. Their pathetic fate, scarcely even among their patients, excited a casual word of sympathy; and yet less deserving men have had altars erected to them. Among my intimate professional friends, I know of three who contracted an infectious disease from their patients,



and all three have died. I am sure that men have been canonized for a service that was less heroic.

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The physicians who have met death from diphtheria, from smallpox, from tuberculosis, in the heroic discharge of duties so common as to seem trivial, cannot be computed. Time has failed to keep a record of the noble dead. A roster of their honored names is out of our power. Obscure heroes, who have fallen in the strife for humanity, fill our churchyards, where they sleep in unacknowledged graves. St. Paul boasted that he was a citizen of no mean city. We may boast in the same spirit that we belong to no mean profession, to no ignoble calling; and, while ungrateful beneficiaries may accuse us of practising medicine for money, we may be sure that alike in city and in country, alike among the homes of wealth and the hovels of destitution, there exists a great body of men who by unselfishness, by fortitude, by kindness and charity, sustain amply the traditions and fulfill worthily the scope of our noble calling. To those men what is a money fee? It is not time and study and care alone that they offer to the afflicted. It is their own strength, their sleep, their very lives that they lavish upon them, and what is a fee in exchange? Do men sell their blood for gold?

I am making no exhaustive compilation of the benefits that physicians have conferred on humanity. The record is open for all to read. One has not to grope and delve to find it. It was estimated that Spencer Wells, in one series of ovariectomies, had added 20,000 years of life to the patients on whom he operated. Is that not raising the dead to life? For even those who were raised from death by Christ and His disciples were not thereby rendered immortal. To raise one from the dead was merely to add a few years to his life. Speaking with due humility, we may say that there is no member of our profession who has not done as much, and many have done far more. Before the discovery of vaccination 3,500,000 people died of smallpox in a year in Mexico. In British India in the year 1770, 3,000,000 died of the same disease, while in Europe the death-rate from this one disease alone averaged 200,000 a year for 1000 years. To-day it is almost a rarity. Since the introduction of compulsory vaccination into Germany, smallpox has practically disappeared from that country, while in the United States it is not probable that one physician in one hundred has ever seen a case.

Who can compute the benefit of a century of vaccination? Reckon, if you can, the saving of human life from the time when hygiene and sanitation expelled the Black Death from Christendom—but first read Boccaccio's account of the plague at Florence and Daniel Defoe's narrative of the Great Plague of London, and you will not need statistics to appal you. By how much has Von Behring shorn diphtheria of its fatal horror, and who can estimate the conservation of life due to diphtheria antitoxin? We are all witnesses to the general apathy shown among the laity toward the extermination of tuberculosis, and I have seen more than one article in the daily press imputing to Robert Koch other than humanitarian motives, and roundly ridiculing him for his expressed doubt as to the transmissibility of bovine tuberculosis to



man, as if by that doubt he had also thrown discredit on his previous labors. It is a curious fact that almost all human incentives to action are due to mixed motives, and the more complex our lives become, the less frequently do simple motives as springs to action determine our conduct, so that any decision is in reality a resultant of forces. It may be that often the benefit of humanity is at times less consciously active than the desire for reputation, or social and professional standing, or popular favor, or some other even less elevated aim, but nevertheless even if we are personally unconscious of this as a constant determining factor in our lives, we cannot wholly withdraw ourselves from the influence and spirit of our calling.

It is but a few years since tuberculosis was regarded as inevitably fatal. The belief in this fatality was rather the cause of Keats's death than the article in the *Quarterly* to which Byron ascribed it. Keats had a slight hemorrhage. He called for a candle and examined the sputum. Then he sank back upon the pillow exclaiming, "That is my death-warrant. I must die." He gave up hope at once. In Keats's day the death-rate from tuberculosis was very high; for every 10,000 of population there were forty deaths annually from this disease, whereas to-day there are only eleven. It would, of course, be too much to say that this vast improvement is due entirely to a better knowledge of the disease, or to improved methods of treatment, since before the year 1882, when Koch discovered the bacillus of tuberculosis, the death-rate had already begun to abate. Much is probably due to a modification of the disease itself. Whatever the cause, however, there is a reason to believe that its rapid diminution, both in prevalence and in fatality, means its speedy elimination from mortuary statistics. It is apparently destined, at least in Dr. Bulstrode's opinion, to become, in another generation, if not entirely extinct, at least as infrequent as typhus fever or leprosy.

Moreover, that is the end to which all the recent advances in medicine are purposely tending—to the eradication of contagious disease. Prophylaxis has become the motto of medicine. The physician is consciously laboring for his own elimination as an economic factor. He is cutting away his own props, he is giving away with open hands his own fields and forests to benefit humanity. This is the inherent spirit of medicine.

Thackeray has a sketch, in one of his "Roundabout Papers," that each of us may easily parallel from his personal observations:—

"About two years since, there was, in our or some other city, a famous doctor, into whose consulting room crowds came daily, so that they might be healed. Now this doctor had a suspicion that there was something vitally wrong with himself, and he went to consult another famous physician at Dublin, or, it maybe, at Edinburgh. And he of Edinburgh punched his comrade's sides, and listened at his heart and lungs, and felt his pulse, I suppose, and looked at his tongue. And when he had done, Doctor London said to Doctor Edinburgh, 'Doctor, how long have I to live?' And Doctor Edinburgh said to Doctor London, 'Doctor you may last a year.'

"Then Doctor London came home, knowing that what Doctor Edinburgh had said was true. And he made up his accounts, with man and Heaven, I trust. And he visited his patients as usual. And he went about healing and cheering and soothing and doctor-

ing; and thousands of sick people were benefited by him. And he said not a word to his family at home, but lived among them cheerful, and tender, and calm, and loving, though he knew the night was at hand when he should see them and work for them no more.

"And it was winter time, and they came and told him that some man at a distance was very sick and wanted him; and though Doctor London knew that he was himself at death's door, he went to the sick man. And the doctor died, and his family never knew until he was gone, that he had been long aware of the inevitable doom."

There seemed to Thackeray something peculiarly noble in this pathetic incident, but there has never been a time, at least since the days of Boerhaave, when physicians of this type have not abounded in the world.

A physician's duties often surpass his professional boundaries. As Sir Thomas Browne finely said, his circle is more than 360 degrees. Disease is not the only thing he has to cure. The sorrowful confessions that he receives, the domestic tragedies that he prevents, the broken hearts that he soothes, the ruined lives that he restores to rectitude, who can enumerate? How memories throng upon the mind when we dwell a moment upon these things! There is something peculiarly tender and holy in these services, and a physician must be not only a good man but a wise one, to direct his patient's feet out of the path of calamity and sin, and into the path of life in its fullest meaning. It has been well said that a physician's hands should be as clean as those of the priest who officiates at the altar.

These are a few of the innumerable glories of the profession of medicine. The achievements that I have mentioned are those of four or five physicians. I cannot speak in detail of Morton, and the discovery of general anesthesia; of Lister, under whose teaching septic surgery was forever abolished; of Pasteur, who instituted the science of bacteriology. These are a part of the heritage which to some extent we all share, that has descended to us and will be transmitted to our successors. This is our birthright. When we contemplate these things, who would not be proud to be associated with the men I have named, to be a colleague of Sydenham and Haller and Boerhaave and Virchow and Pasteur? It is not given to us all to equal their achievements or to rival their renown, but we can at least keep our own lives pure, our own ideals intact, our own honor blameless, that through us the profession of medicine like the ancient Roman Republic, *ne quid detrimenti capiat*, may sustain no harm.

## ORIGINAL ARTICLES.

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### SHOULDER DISABILITY; A FURTHER STUDY OF ITS VARIETIES AND THEIR TREATMENT.\*

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(From the Third Surgical Service, Mount Sinai Hospital.)

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The subject of this communication is one of general medical interest and great importance, for it concerns a very common and much misunderstood condition, or set of conditions, seen frequently by the general practitioner, because often regarded as rheumatic; by the neurologist, because often mistaken for brachial neuritis; and by the surgeon, the orthopedist, and the physical therapist, because sometimes obviously traumatic in origin or requiring mechanical treatment.

These are the sometimes quite acute but often gradually developing, tormenting, lingering, and, unless properly treated, obstinate cases of 'stiff and painful shoulder,' or as I prefer to call it, 'shoulder disability,' since either the pain or the limitation of motion sometimes greatly preponderates or exists alone.

*The pain*, especially in acute cases, may be fairly constant. In other cases it is usually intermittent,—sometimes spontaneous, sometimes only on motion or attempted motion. Quite often the pain is very severe at night, interfering with sleep, or relieved only by putting the arm in a certain position. Sometimes, even in long-standing cases, the pain is intense; sometimes it is rather a nagging sensation as of a 'kink in the muscle.'

The pain is perhaps most commonly referred to the outer or the anterior aspect of the arm, but often, although sometimes vaguely, to the shoulder itself,—occasionally to the point of the shoulder. In some cases it radiates into the neck, the forearm or even the

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\*Read, in part, before the Medical Society of the District of Columbia, December 9th, 1914.



hand; it is in these instances that the condition is most apt to be mistaken for brachial neuritis.

The most striking feature of the *stiffness* is limitation of abduction. The patient may be able to raise his arm only 20° or 45° or 90°, and passive abduction will usually be but little more; or he may be able to abduct fully, but awkwardly and with great effort or pain. Sometimes the limitation of motion is due to mechanical obstruction; but very often it is the result of spasm or is caused by pain or the fear of pain.

Rotation, external or internal, or both, is also affected. The patient may not be able to reach his arm behind the back (internal rotation), or to bring his elevated forearm back towards the occiput (external rotation).

When the shoulder movements, passive as well as active, are very limited,—amounting in spastic cases almost to a scapulo-humeral fixation,—the mistaken diagnosis of arthritis is apt to be made by the unwary examiner, especially if, as sometimes happens, a little crepitus is elicited.

Swinging the arm forward and backward is usually fairly free in most types of shoulder disability.

*Points of tenderness* about the shoulder, concerning the diagnostic significance of which much enthusiasm has been wasted, are often present, often absent, and very often, indeed, deceptive. The point of tenderness I find most constant in shoulder disability is anteriorly, over the lesser tuberosity; and since it can be elicited in several forms of shoulder disability, I accord it little diagnostic value *by itself alone*, although, as I shall later point out, it is weighty clinical evidence when there is acute sensitiveness to a very light touch. A spot, tender to slight or fairly deep pressure, may be found externally below the acromion margin, or posteriorly over the infraspinatus tendon, or elsewhere.

In most cases there is no *deformity* of the shoulder. If the disability has lasted for a few months, there may be moderate or marked atrophy of the deltoid and the spinati muscles,—sometimes the biceps. These atrophies, too, may easily mislead one to a diagnosis of neuritis or other brachial nerve lesion.

I have thus briefly described the most striking signs and symptoms of shoulder disability, not merely to set up a general picture, but also because the various types so overlap symptomatically that this general description may well be applied to most of them. Indeed, even in what seem to be characteristic cases of one or another kind of shoulder disability, I make it a rule to withhold my diagnosis until I see the *Roentgen-ray picture*,—after which I sometimes considerably modify my opinion.

This, then, in brief, the general description of a condition notorious in surgical clinics as persisting after shoulder injuries, and

equally often noted without antecedent external violence,—a condition variously regarded as arthritis, joint ankylosis, rheumatism, neuritis, and circumflex paralysis. Until recent years those who were unwilling to accept these unsatisfactory diagnoses contented themselves, as much as they could, with the conception of a peri-arthritis (the *periarthrite scapulo-humérale* described by Duplay<sup>1</sup> in 1872) which, vague as it is clinically, has the merit that in shoulder disability of various types there often is, indeed, an inflammatory reaction in the periarthritic structures.

Although Jarjavay<sup>2</sup> had described acute bursitis following shoulder injuries, and Kuester<sup>3</sup> found subacromial bursitis as an occasional lesion in stiff shoulder, the possible significance of these publications made no impression until, in 1906 and in a larger article in 1908, Codman<sup>4</sup> established that subacromial (subdeltoid) bursitis is a frequent cause of 'stiff and painful shoulder,' and clearly described its symptomatology and its anatomical features. Although my own operative findings in subacromial bursitis have revealed some conditions not seen by Codman, and although they cannot be brought into accord with his classification or with all his therapeutic measures, I regard his pioneer work as a notable piece of clinical research and anatomical study.

My experience indicates that subacromial bursitis and its congener—injury to the supraspinatus tendon or, sometimes, the infraspinatus tendon—is, indeed, if not 'the common cause' of stiff and painful shoulder, as asserted by Codman, at least the most frequent single cause. It leaves to be explained, however, many cases in which the bursal and tendon lesion can be excluded.

Several of these, in my series, were due to fracture of the greater tuberosity of the humerus.

The ease with which the shoulder is dislocated in some individuals, the frequency with which such dislocations are reduced spontaneously, and the disability that notoriously persists after shoulder dislocations, all led me to think that many of the obscure cases of stiff and painful shoulder have their origin in an unrecognized spontaneously reduced dislocation (and this may occur, in some individuals, from a mild indirect violence). In 1911 a case presented itself which established the correctness of this hypothesis. A woman who, a week before, had fallen on her elbow, presented when I saw her the familiar picture of 'shoulder disability.' I had barely raised her arm to the horizontal, in the course of gentle diagnostic manipulations, when the head of the humerus dislocated itself below the coracoid. Clearly this patient had a rent in the capsule of her shoulder-joint, produced by a dislocation a week before, which had been spontaneously reduced.

In that year appeared an article by Thomas,<sup>5</sup> of Philadelphia, in which he expressed the same thought, viz., that unrecognized dis-

locations, spontaneously reduced, are a frequent cause of stiff and painful shoulder. He grouped with this injury milder tears of the axillary portion of the capsule due to sprains without dislocations, and he essayed to establish 'periarthrititis from tears of the axillary portion of the shoulder capsule' as *the* essential cause of stiff and painful shoulder. In a later paper<sup>6</sup> he quoted my observation properly enough, in support of his contention, which must be rejected, however, as an explanation of the entire pathology of shoulder disability, for Thomas fails in his effort to explain by it both fracture of the tuberosity by indirect violence and, especially, subacromial bursitis, as clearly demonstrated at operation by Codman, Painter,<sup>7</sup> Baer,<sup>8</sup> and myself—and, here and there, by others.

Evidently without any personal experience of cases of subacromial bursitis, Thomas attempts by pure hypothesis to bring this condition into the same category as capsule tear—an entirely different condition. "My contention is," he says, "that the cause of the trouble in the bursa is an extension of the capsule tear from the axilla to the outer side of the joint, the overlying tendons in the region of the greater tuberosity giving way also and frequently taking with them a portion of the tuberosity. The chief cause of the stiffness and pain, however, is the contraction in the axillary side of the joint." In an earlier paper on "Shoulder Disability"<sup>9</sup> I said of fracture of the greater tuberosity that "the tenderness and the disability may be indistinguishable, I think, from those of bursitis and even the skiagraph may deceive the *inexpert*" (in its general resemblance to that of a small calcareous deposit). Misinterpreting my meaning, Thomas goes on to say, "The difficulty which he [Brickner] experienced in making the diagnosis between fractures of the greater tuberosity and 'calcification' of the subacromial bursa is a valuable aid in showing that the 'calcifications' are fractures of the tuberosity."

My operative findings in 8 cases of subacromial bursitis and calcareous deposit amply disprove Thomas' hypothesis. They showed: That there is no extension of the capsule tear (no evidence of capsule injury was found in any case); the tuberosity was unfractured, and the calcareous deposit, sometimes fluid, was in no wise related to the tuberosity, and in several cases was remote from it; when the deposit was buried within the supraspinatus tendon or the infraspinatus, there was no surface tear of the tendon. That "the chief cause of the stiffness and pain is the contraction on the axillary side of the joint" is disproved also by the fact that extensive bursal adhesions and large calcareous deposits may be found in patients who have had *no limitation of motion*, and their pain is relieved by dividing the adhesions and removing the deposit. Even those who have no experience with the condition will be at once convinced, I believe, that the very extensive cal-



careous deposit shown in Fig. 1 cannot by any stretch of the imagination be regarded as a mere fracture of the tuberosity. (Operation in the case of which Fig. 1 is the roentgenogram revealed a dense, gritty subbursal lime deposit and a normal tuberosity.)

It is no more reasonable to insist upon a single cause of 'stiff and painful shoulder' than to attribute to all cases of stiff and painful knee any one pathology. The attempts to establish a single cause for all cases of shoulder disability serve only to continue rather than to clear the earlier confusion, and lead to many errors. It has, therefore, been my effort in a clinical study of several years, based on a large number of cases, to distinguish the various forms of shoulder disability and to elucidate those passed over by others.

In my earlier paper I concluded: "In any case of shoulder disability we must exclude *bona fide* brachial neuritis, intra-articular lesions (including luxations), gross fractures of the humerus, fracture of the acromion, the scapula, and even of the clavicle, a gross or developing lesion in the head of the humerus (gumma, tuberculosis, neoplasm), cervical rib and acromioclavicular luxation. If these can all be excluded we may look for a bursitis (coraco-brachial or, more especially, subacromial) for an injury to the supraspinatus tendon, perhaps involving the bursa or the greater tuberosity, or for a fracture of the tuberosity itself. If physical signs and skiagraph show none of these, the condition may have arisen from a spontaneously reduced dislocation of the shoulder or, as suggested by Thomas, a lesser tear of the capsule by a sprain."

In the light of further experience I would now list the causes of shoulder disability as follow:—

1. Subacromial bursitis.
2. Subacromial bursitis with injury to the supraspinatus or, occasionally, the infraspinatus tendon, and calcareous deposit.
3. Spinatus tendon injury with slight or perhaps no associated bursitis.
4. Fracture of the greater tuberosity of the humerus.
5. Subluxation (forward) of the humerus.
6. Spontaneously reduced dislocation; with which, of course, may be grouped disability following surgically reduced dislocation.
7. Sprain or tear of the capsule without dislocation.
8. Subcoracoid bursitis.
9. Biceps tendovaginitis.
10. Traumatic periostitis.
11. Developing syphilis, tuberculosis and neoplasm of the head of the humerus.
12. True brachial neuritis.
13. Unclassifiable cases, most of which probably belong to one

or another of the above groups, but some of which perhaps remain to be accounted for otherwise.

1, 2, 3. The first three of these conditions—*subacromial bursitis*, *spinatus tendon injury*, and *their combination*—may appropriately be considered together.

In a recent article<sup>10</sup> I pointed out the fallacies of the generally accepted notions concerning the subacromial bursitis of shoulder disability. There is *no* diagnostic point of tenderness; there is usually little or *no* swelling; the shadow seen roentgenographically is *never* due to thickening of the bursal walls; it is *always* caused by calcareous deposit; this deposit is *never in* but always *beneath* the bursa, in or on the supra- or, sometimes, the infraspinatus tendon; removal of the bursa is *unnecessary*, and its complete excision, as recommended in some books, is impossible except by mutilating dissection; the condition does *not* arise from bacterial or toxic irritation; excluding the rare tuberculous form, and the occasional metastatic suppurative condition, subacromial bursitis is traumatic, resulting probably from bruising the bursa and, often, the underlying tendon between the head of the humerus and the acromion. (At operation or on the cadaver abduction of the arm will indicate how readily these soft structures can be compressed between the two bony surfaces.) The trauma may be by external violence, as a fall on (?) the shoulder or, especially, on the outstretched arm. Very often, however, there has been no external violence and in these cases the injury arises from an unduly vigorous passive or active abduction of the arm, as by the lurch of the body while hanging to a street car strap, or suddenly throwing the weight of the body on the outstretched arm while scrubbing the floor, or in such gymnasium pursuits as flying rings, basket ball, etc.

Subacromial bursitis and calcareous tendon deposit seem to occur only in adults. The lime formation appears to bear no relation, however, to gouty or other diathesis, nor is it a slow or late process. I have found the calcareous deposit at operation sixteen and seventeen days after trauma, and roentgenographically ten, five, and even two days after. Whether early or chronic, intra- or extra-tendinous, it may be dry and gritty or semi-fluid.

The roentgenographic appearance of the deposit varies considerably, and the size of the shadow bears no relation to the severity or the duration of the symptoms. It may be very large, as in Fig. 1, or very small (Fig. 2), or multiple (Fig. 3), or appear to follow more or less evenly the line of the bursa (Figs. 4 and 5). It is this latter appearance, especially, and the faulty observation, at operation, of Painter, that have led to the generally accepted notion that the lime formation is in the bursa. (Holzknecht even speaks of it as a 'bursalith'.)

In hyperacute cases of subacromial bursitis the pain is very se-

vere, fairly continuous, and aggravated by the slightest movement; the patient hugs the arm to his chest, and vigorous spasm promptly resists efforts at passive abduction or rotation. There is, at the outset, slight swelling in the deltoid region.

In subacute and chronic cases the signs and symptoms vary within wide limits. There may be marked or moderate limitation of abduction and of rotation (especially, in my experience, of internal rotation); passive movements may or may not be freer; swinging the arm forward and backward is usually free and painless. The pain may be severe or moderate, continuous or intermittent, spontaneous or only on motion, and is often most troublesome at night.

What I have come to regard as the most nearly characteristic combination of signs and symptoms is the following: Pain in the upper arm (most often its anterior aspect), extending towards the elbow and sometimes into the flexor aspect of the forearm; pain at some time or other in the shoulder region itself, as on abduction or internal rotation; marked, sometimes exquisite tenderness over the *lesser tuberosity* of the humerus, *i. e., anteriorly*. To these may be added more or less limitation of abduction and of internal rotation, sometimes also of external rotation. This limitation is usually due to spasm, but it is not infrequently mechanical. If the 'stiffness' has lasted for several weeks there may be marked atrophy of the *spinati* and the deltoid; otherwise there is no deformity.

The pain, most often referred to the arm, may instead, or also, be in the shoulder region itself, and occasionally it radiates into the neck or into one or more fingers. Even when it is not severe, it is of a tormenting and persistent character that interferes with work (if it is a pain on motion) or with sleep (if it is spontaneous), and sooner or later brings the sufferer to the physician for relief. Pain in the shoulder on lowering the abducted arm is a common but by no means pathognomonic symptom. Tenderness to pressure, most often found below the acromion *anteriorly*, may, instead, be located externally or posteriorly, or be absent altogether.

The 'stiffness' (limitation of movements) which other writers have described as characteristic of subacromial bursitis, is by no means a constant factor. In my experience it may be entirely absent—the patient may never have had any limitation of motion in any direction, or the movements may be complete but with effort or with pain. *And this freedom of shoulder movements, I repeat, may exist even though the bursa is found at operation to be extensively occupied by adhesions.*

On the other hand, some patients complain more of the loss of motion than of the pain. The 'stiffness' then may be marked or moderate, *e. g.*, the patient cannot readily put his hand in his



trousers pocket or adjust his clothing in the back, or he may be able to abduct his arm to the horizontal but not beyond.

*Treatment.*—In acute cases, if there is severe and increasing pain and loss of function and the roentgenogram shows lime deposit, open operation affords the promptest relief; it aborts a condition that would otherwise be very prolonged. In less severe acute cases, especially if without evidence of tendon injury, rest in bed with, or followed by, graduated abduction, should be given a full trial. In chronic cases much can often be accomplished by conservative measures, especially abduction treatment.

I have no doubt that some cases with lime deposits become more or less quiescent, or even eventually undergo a spontaneous functional cure; but in my personal experience none of the patients with lime deposits has been relieved of pain by any method, except those operated upon. If the pain and loss of function interfere with sleep and work, if the muscles are undergoing atrophy and, especially, if there is a lime deposit, operation provides the surest means of early cure. The breaking of bursal adhesions under narcosis is not only more uncertain, but more dangerous to surrounding structures.

*The operation* I employ, and which I have described elsewhere, is the following:—

The patient is turned partly on his side, and a pillow is placed under the affected shoulder to expose conveniently its outer surface. The forearm and hand, which may be laid across the body, are wrapped in sterile towels or pillow-case, so that, if necessary, an assistant can manipulate the extremity.

A two-and-a-half to three-inch vertical incision is made from the external border of the acromion process, downward over the greater tuberosity, *i. e.*, towards the external condyle.

The exposed deltoid muscle is split in the same line, largely by blunt, partly by sharp dissection.

Retraction of the muscle exposes the roof of the bursa. This is drawn up, away from the bone, with two forceps, and freely divided between them, in the line of the muscle incision.

With retractors in the bursa its interior is thus freely exposed where it is usually most affected, *viz.*, over the greater tuberosity.

Adhesive strands or bands are divided with scissors, or excised (Fig. 6). 'Villous' or 'papilloma-like' masses, as described by Painter and Codman, if found, are cut away. With curved scissors, concavity towards the humerus, the sac is then explored below (towards the deltoid insertion), anteriorly, posteriorly, and above (under the acromion), and any further adhesions are divided. The bursa is then explored with the finger, the arm being rotated backwards, then forwards, and pulled down upon, to facilitate this palpation, if necessary. At the site of maximum injury the bursal



Fig. 1. Extensive cap-like calcareous deposit lying beneath the subacromial bursa.



Fig. 2. Small calcareous deposit.

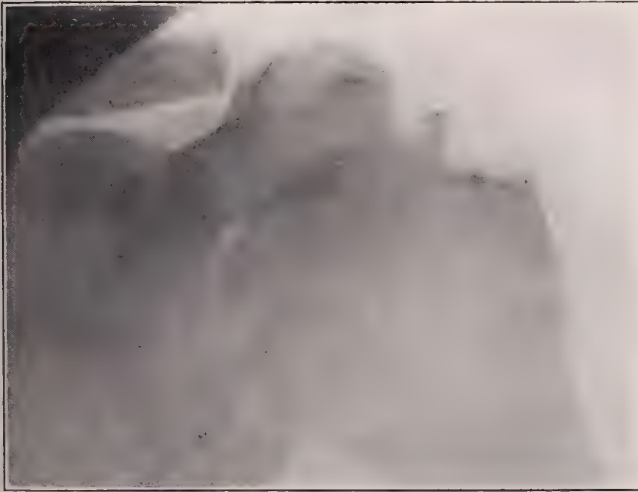


Fig. 3. Multiple calcareous deposits.



Fig. 4. Calcareous deposit following the line of the bursa.



Fig. 5. Irregular calcareous deposit lying in the supraspinatus tendon.



Fig. 12. The arm is abducted in plaster of Paris.



Fig. 13. Syphilis of the head of the humerus. Note the necrosis, the rarefaction, and the characteristic periostitis.



Fig. 14. Tuberculosis of the head of the humerus.



Fig. 15. Carcinoma of the head of the humerus. Note the rarefaction of the bone, and thinning of the cortex, but note also that, unlike the appearance in sarcoma, there is no expansion of the bone shell.



Fig. 16. A simple, easily regulable treatment of shoulder disability.

! of applying abduction in the



wall may be more or less thickened. I have not seen it thick enough to suggest the necessity of excising even small areas.

The floor of the bursa is now incised, in the same dissection line, over the greater tuberosity and the supraspinatus insertion, and dissected up from the tendon.

If a deposit, fluid or solid, is thus found, it is removed with a blunt spoon (Fig. 7). The tendon thus exposed will reveal a superficial injury or a distinct small transverse tear, within which is more of the solid or cheesy material. The edges of the rent are trimmed with a scalpel to remove adhering granules and frayed fibers. The tendon wound is closed with a couple of vertically placed chromicized catgut stitches (Fig. 8).

If no extratendinous deposit is found, the supraspinatus tendon is opened axially, at the point suggested by the roentgenograph, if necessary enlarging upward the incision in the floor of the bursa. The tendon wound is retracted and the deposit is spooned out (Fig. 9). The tissue immediately surrounding the deposit is trimmed away with the granules adhering to it. The tendon is sutured with transverse stitches of chromicized catgut. (See Insert, Fig. 9.) If no deposit is found in the supraspinatus, the infraspinatus is opened axially and the material removed therefrom in the same way.

The above two paragraphs refer to those cases in which the roentgenograph shows a shadow. In all cases, however, I think it worth while to examine the tendons for a possible tear, through a small incision in the floor of the bursa.

The incision in the bursal floor is closed with fine catgut sutures (Fig. 10). In some cases of very adherent extratendinous deposit, these cut edges of the bursa are so frayed at this site, after it has been dissected up, that it cannot be entirely approximated over the tuberosity.

A thin layer of vaseline is spread over the lining of the sac with the gloved finger or a smooth instrument. No small lump of the lubricant is left in, lest by encystment it might cause adhesions. In spite of this theoretical objection to the vaseline, I have found that it behaves well in these cases, and I believe that it probably prevents the immediate re-formation of the adhesions.

The roof of the bursa is sutured completely with catgut (Fig. 11).

The deltoid muscle is allowed to fall together. I usually insert a few catgut stitches.

The skin wound is closed without drainage.

The arm is dressed in abduction of about 120°, in a light plaster of Paris spica (Fig. 12).

*Post-Operative Treatment.*—This abduction, which I think is important, is continued until the first dressing,—eight to ten days. After the cast is removed the healed wound needs but a bit of gauze and adhesive plaster or collodion; and the patient is free to move

his arm about. He is instructed to move it but little and gently at first, to rest it in a sling when sore or fatigued, and at night to abduct it as much as he comfortably can on pillows, or with a bandage carried from the wrist to the head of the bed. Two weeks after the operation, more active movements are instituted, if necessary. The length of time needed for full restoration of shoulder function depends upon how much and how long it had previously been interfered with. In cases of moderate disability, cure may be complete, or nearly so, within a month. In more severe cases it will take two or three months to effect restoration of full mobility, by means of light Indian club exercises, etc.

4. *Fracture of the greater tuberosity of the humerus*, when of considerable extent and due to external violence, may be recognized by the local pain, tenderness, swelling, and ecchymosis. When of slight extent and resulting from mild or internal violence, it presents about the same picture as subacromial bursitis, and can be diagnosed only by the roentgenogram; and here, too, the simulation is close, for to the inexperienced the small shadow of detached bone fragment may much resemble that of a calcareous deposit. The clinical resemblance of the two conditions is not surprising, for in one there is (often) a tear in the tendon; in the other, there is a tear in the bony attachment. With fracture of the greater tuberosity, the tenderness is at that site, viz., externally.

The ideal treatment of this condition would be abduction of the arm in bed, until the fracture heals. This, of course, is scarcely to be recommended. Good results will follow fixation of the arm in moderate abduction for two or three weeks, interrupted at intervals for passive abduction, and followed by graduated movements to prevent stiffness.

In a case of slight tuberosity fracture with persistent disability, not yielding to other treatment, one would be justified in suturing the torn supraspinatus attachment in place.

5. *Subluxation of the humerus*, traumatic in origin, is but little mentioned in recent literature. Described by Astley Cooper<sup>11</sup> and, more clearly, by Malgaigne,<sup>12</sup> the occurrence of an uncomplicated, incomplete, traumatic dislocation of the shoulder has been denied by Hamilton,<sup>13</sup> Stimson,<sup>14</sup> and others.

Based on the observation of 3 cases, I have elsewhere<sup>15</sup> shown that pure, traumatic (forward) subluxation of the shoulder is a real clinical entity and constitutes an occasional cause of shoulder disability. I shall not here again enter into the anatomy or literature of the condition. It may be produced by mild violence. It is marked by slight prominence of the head of the humerus in front, and a corresponding depression behind, slight or no appreciable flattening of the deltoid—all much less than in full dis-

location. It produces pain in the shoulder, radiating down the arm, and inability to abduct; rotation, however, may be but little inhibited. It shows nothing abnormal in the roentgenograph. In my 3 cases the deformity disappeared (in 2 cases with a distinct snap) on abducting the arm to the horizontal. Continued abduction for ten to fourteen days effected cures.

6. *After the spontaneous or deliberate reduction of a dislocation*, it is important to prevent the development of stiffness by the same measures as in fractures of the tuberosity, or gross fracture. If disability has already developed it is to be overcome by abduction treatment, passive movements and massage.

7. *Sprains and lesser tears of the capsule* are diagnosed in old cases chiefly by exclusion. In fresh cases there is general tenderness about the joint, slight swelling, pain in the shoulder, and limitation of movements. This condition, too, is best treated by abduction.

8. *Subcoracoid bursitis* is not a very common affection. The bursa is situated below and to the outer side of the coracoid process, partly beneath the coraco-brachialis. At this point there is distinct tenderness, but the same area is often sensitive in brachial neuritis. There is often pain on abduction, or inability to hold the arm up when abducted. The most characteristic pain and disability is in drawing the arm forward as in pulling on an overcoat sleeve. Forcibly pulling down the arm causes pain in the shoulder. Iodine, aspirin, and resting the arm in a sling effect a cure.

9. *Biceps tendovaginitis*, one of the conditions to which the 'glass arm' of baseball players has been attributed, is manifested by tenderness in the bicipital groove, pain on strongly flexing the supinated forearm, and pain when the arm is swung back and forth, the head of the humerus then gliding under the biceps tendon. Treatment is by local rest and anodynes.

10. *Traumatic periostitis*, as of the acromion process, needs no special description. Unless acute it can be recognized in the roentgenograph.

11. *Syphilis, tuberculosis, and new growths of the head of the humerus*, when developed, are usually readily distinguished from the other conditions under consideration; but in their early stages they may present only the features of a 'stiff and painful shoulder' as described above. It is then that roentgenography is the most valuable diagnostic aid, and I have learned to rely chiefly upon it in the recognition of these conditions and in their differentiation one from the other<sup>16</sup> (Figs. 13, 14, 15).

12. *Brachial neuritis* I have included in this list because it deserves special consideration, since sometimes the pain in the shoulder is a prominent symptom. Shoulder disability of other types is often mistaken for neuritis, especially when there is



atrophy of the deltoid and spinati and radiation of the pain toward, or into, the hand: In various shoulder disabilities there is, indeed, an associated circumscribed neuritis or an extensive brachial neuralgia.

True brachial neuritis is rare. It is to be differentiated by tenderness of the nerves in the neck, the coracoid region and the arm; if long-standing there are also objective sensory, trophic and motor disturbances.

13. *The unclassified cases* are those presenting the general picture of shoulder disability in which neither physical signs nor roentgenography point definitely to any of the lesions above considered. Fortunately, however, they respond admirably to abduction treatment.

*Abduction treatment*, to which I have repeatedly referred, is of great importance in several varieties of shoulder disability, both in early cases to prevent and in late cases to overcome the stiffness and loss of motion. Various abduction splints and apparatus have been devised, but they are all more or less clumsy, awkward to wear and apply, and possess the great disadvantage that they are not easily adjustable from hour to hour and cannot be discontinued and resumed at intervals as the patient's pain or fatigue may indicate. For some time, therefore, I have employed, with great satisfaction, a simple automatically regulable abduction method that I have elsewhere described<sup>17</sup>:—

"The patient is put to bed in semi-recumbent position, supported on pillows, not too soft. He abducts the affected arm, on the pillow, as far as he comfortably can. A muslin bandage is then looped lightly about the wrist or elbow and carried to a convenient spot on the headpiece of the bed, where it is fastened. The upper end of the bed is then raised on 'shock blocks' or chairs (Fig. 16). As the patient's body little by little slides down in bed, his arm travels (relatively) further and further up, and thus a shoulder that obstinately resists forcible efforts at abduction yields steadily, painlessly, to this gradual countertraction, which the patient often does not even feel. It is striking to observe that a person whose shoulder for months has not been abducted, actively or passively, beyond 45°, put thus to bed in the afternoon, may be found the next morning with his arm alongside his head! Few cases respond so quickly, however. The treatment may require a week or even more, to restore full abduction."

In those instances in which the condition does not demand, or the patient will not consent to continuous treatment, it may be employed only at night. It may be applied also, but not so satisfactorily, in a large reclining chair.

The various modifications of this simple procedure need not here be repeated. They will probably suggest themselves. It is worth

while emphasizing that all adjustments can be made by the patient himself, and no special attendant is needed.

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## THE NON-INFECTIVE CAUSES OF SO-CALLED RHEUMATISM.\*

By EDWARD H. GOODMAN, M. D., of Philadelphia.

When one elects to consider the non-infective causes of so-called rheumatism, his field of activity naturally centres about gout, which, of all the so-called rheumatic conditions, is to-day generally held to be of non-infective or non-bacterial origin. I have purposely and advisedly used the word 'generally' in preference to 'universally,' as there are still some who hold to the belief that gout owes its existence to bacterial agencies. These advocates of the bacterial toxemic theory attempt to see in the constitutional and local symptoms of gout a resemblance between this disease and such toxemic states as septicemia, rheumatic fever, acute rheumatoid arthritis and other forms of infective arthritis. An altered state of the gastro-intestinal tract, catarrhal inflammation of the intestinal mucosa arising from the ingestion of irritating and indigestible food-stuffs, is the first stage, and these changes subsequently influence the numbers and potentialities of the intestinal bacteria, resulting in the production of a toxin to which in turn an attack of gout is ascribed. In other words, bacteria which normally infest the intestines, may, under circumstances, assume a pathogenic function. This view, fascinating as it may seem, suffers from the lack of weighty evidence to support it. To be sure, Boerhaave thought that gout was a contagious disease, and Van Swieten supports this theory by bringing forward cases where gout had developed in women who had nursed their husbands through an attack.

I cannot forbear from repeating some historic lore concerning gout. As early as the fifth century B. C., Hippocrates tells us that the disease was a well-recognized one, and we know that Diocles and Praxagoras were familiar with gout, and that Ptolemy was treated for the disease. Cicero mentions the affliction as being a very common one in the Roman Empire at the time when society was indulging in luxurious living and debauchery of all sorts. Galen remarks (130-200 A. D.) that "in the time of Hippocrates there were only a few who suffered with Podagra, such was the moderation in living, but in our own times, when sensuality has touched the highest conceivable point, the number of patients with the gout has grown to an extent that cannot be estimated." Until the sixteenth

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century, nothing further was contributed, but Paracelsus apparently finds the disease very common.

The term gout (French, *goutte*, drop, gout, Latin *gutta*, a drop) owes its derivation to the idea "of the dropping of a morbid material from the blood in and around the joints."

Perhaps the earliest of the accurate writers on gout is the immortal Thomas Sydenham, the English Hippocrates, born in 1624. At the age of twenty-five he first experienced the torments of the distemper, which distressed him during his lifetime and which, with the superadded torture of a renal calculus, brought about his death, December 29th, 1689. His "*Tractatus de Podagra et Hydrope*" (published at London, 1683) may be considered in a sense autobiographical. He is very exact in his description of the rise, progress, causes and symptoms. As the etiological moment is the theme of our discourse this evening, we pause for a moment to quote his views. He writes: "The more closely I have thought upon gout, the more I have referred it to indigestion, or to the impaired concoctions of matters, both in the parts and the juices of the body. Gouty patients are, generally, either old men, or men who have so worn themselves out in youth as to have brought on a premature old age—of such dissolute habits none being more common than the premature and excessive indulgence in venery and the like exhausting passions. Add to this the intermission or sudden abandonment of those exercises to which from their youth upwards they have been accustomed. Whilst these were kept up the blood was invigorated, and the tone of the body rendered firm and steady. When, however, they were dropped, the animal spirits gave way, the frame lost tone, and the assimilation became imperfect. Hence the recrementitious portion of the juices of the body, which had hitherto been cleared off by the exercise in question, accumulated in the vessels and supplied the germ of the disease. Sometimes also, serious study or prolonged meditation has increased the evil. This they have done by diverting the volatile spirits from their proper function of assimilation.

"Add to this, that great eaters are liable to gout, and of these, the costive more especially. Eating, as they used to eat when in full exercise, their digestion is naturally impaired. Even in these cases simple gluttony and the free use of food, although common incentives, by no means subsequently pave the way for gout as reckless and inordinate drinking. This annihilates the ferments, due to the different digestions, it throws down the digestions themselves, and through the over-abundance of adventitious vapors, subdues and disperses the natural spirits. Then at once and the same time the energy of the spirits which are the instruments of digestion is diminished. Then also a vast mass of humors oppresses the blood. Then too the different concoctions are imperfectly per-

formed. Then the receptive viscera are overworked, and then the spirits, which have long been giving way, are penetrated. If it were not so, if it were a simple weakness of the spirits, children and women and the victims of long illnesses would be equally gouty. On the contrary, however, it is the hearty and robust. These it attacks only during the decline of their heat and natural spirits. When this takes place, a congestion of the humors supervenes. From the two together the due concoctions are vitiated and perverted."

In a "Treatise of the Gout" by John Colbatch, published in 1698, the following remarks concerning the etiology of gout will be found quaint and not uninteresting. "I assert that the cause of the Gout is not from the blood's abounding with acid, but, on the contrary, with alkalious particles, and therefore if ever we design to attempt to cure the gout of the said distemper with any sort of certainty, it must be by the means of proper acids.

"In all diseases the physicians have hitherto unanimously agreed that acids have abounded; and if the acid has abounded to such a degree that with their alkalies they could not conquer it, why then the patient has died. Well, but suppose this true, How then comes the dead body to stink so soon? Everybody knows that acids preserve animal substances from stinking and corruption, and therefore, if the juices of the dead body were full of acids, it is difficult to conceive how the body should so soon begin to putrefy; nay, it were altogether impossible it should be so. But alkalies promoting putrefaction in animal substances, from the sudden putrefaction of dead bodies it is natural to infer, that the juices were too full of alkalies, which causes first the disease, then death, and afterwards the sudden putrefaction."

Our author subjects his hypothesis to a chemical test by noting the change of syrup of violets from blue to that of greenness on the addition of blood, a proof that it must certainly abound with alkalious particles. A certain nomenclature sounds strange to us. "When it [the gout] affects the joints of the hands or fingers it is called *chiragra*; when it affects the hip, it is called *sciatica*; when it affects the knees, it is called *gonagra*; when the feet, *podagra*; when the ankles, *talia* or *talla*." As to the class of patients affected, he says, "If it be any satisfaction to men in misery to be accounted among the number of those who are men of sense, all people who are afflicted with the gout may claim that privilege, for as to my own part, I never yet met with one blockhead or fool ever troubled with it, which is taken notice of by almost all that have written up on this subject."

Colbatch sums up the causes as being

1. Too moist a state of air.
2. The use of many sorts of meat.

3. The often use of strong wines, especially fasting.
4. The immoderate use of venereal exercises.
5. Overmuch sleep, especially in the afternoon, and that immediately after dinner.
6. Overmuch watching and fasting, study, sorrow, and care.
7. Overmuch rest and ease.
8. Sudden rest and exposure of the body to the air in cold or moist seasons after any violent exercise.
9. The total leaving off any accustomed exercise.
10. From the keeping of the feet either too hot or too cold.
11. From the stopping of any usual evacuation, as the monthly courses in women, and a flux of the hemorrhoids in men.

This ancient history of gout will be brought to a close by giving Warner's view (1768). "That the gout is a disease from the retention of some matter, whether urinous, saline, viscid, tartarous or earthy, which ought to be discharged."

One may be on first thought led to smile complacently at the obscure ideas of the ancient physicians concerning the etiology of gout. They are so vague and intangible on the one hand, and so all-comprising on the other, that naught but confusion arises. That we are but little more advanced in our conception of the true etiological factor in gout, one may readily learn from the many monographs on the subject. I am sure that at the termination of this paper, no one's information will have been broadened, let me hope from but little fault of the essayist however, who aims to present the facts as plainly as possible.

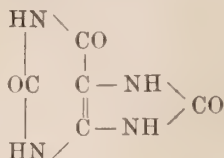
Two phenomena loom up prominently in the modern researches on gout, the accumulation of uric acid in the blood and the deposit of urates in certain tissues of the body. As to the wherefore of these phenomena no one can fully say, although theories will shortly be presented for your consideration.

The present conception of the disease had its beginning in 1775, in which year Scheele discovered uric acid in the urine and in calculi, but in 1848 the intimate relationship between uric acid and gout was proved by Garrod. We have been taught to believe that the underlying cause of gout is the excess of uric acid in the blood despite the fact that in leukemia, in pneumonia and in suppuration there is also an excess, yet the patients are not necessarily gouty. The uric acid theory is at present tottering on its unstable foundations, and we are growing more and more inclined to the view that not uric acid, but rather disturbance of intermediary purin metabolism is at the root of the evil.

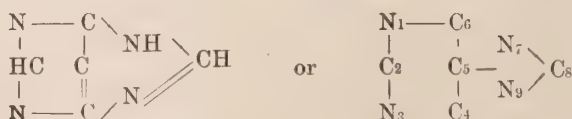
In as brief a time as is concomitant with clearness, I shall endeavor to present the essentials regarding normal uric metabolism and the disturbance of purin metabolism seen in gout.



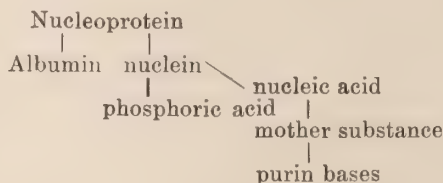
*Normal Nuclein Metabolism.*—Uric acid has the formula  $C_5H_4N_4O_3$ , the structural formula being



It is a derivative partly of nuclein of cell nuclei and partly of hypoxanthin arising from muscle metabolism. Four other compounds are derived from nuclein—namely, xanthin, hypoxanthin, adenin and guanin, and five others are believed to be closely allied, heteroxanthin, paraxanthin, episarkin, caruin and epiguanin, all ten compounds being called alloxuric bodies (Kossel) on account of each being made up of an alloxan and urea nucleus. All have in common a hypothetical body 'purin' (Fischer), having the formula  $C_5H_4N_4$ , the structural formula being



The alloxuric or purin bodies are thought to be contained in the nuclei acid of the cell nucleus in the form of a loosely combined phosphorus compound. Diagrammatically expressed when a cell breaks down the following changes are seen.



The purin bodies, the main source of uric acid, may be considered under two headings, 'exogenous' and 'endogenous,' the former being derived from the ingested food and the latter resulting from the disintegration of body nucleins.

It has been found that endogenous purins are chiefly derived from muscle, particularly the hypoxanthin radical (Burian). The amount of uric acid thus manufactured is fairly constant, being about 0.3 to 0.4 grm. a day, that is, while the subject is at physical rest. Muscular exertion is followed by a decided rise in the amount of uric acid.

As to the place of formation of uric acid, nothing definite is known. Garrod, and those directly influenced by his researches, believed the

kidney manufactured the substance, but extirpation of the kidneys in birds and snakes is followed by an increase in uric acid in the blood and tissues, so we know, at least in these vertebrates, that the kidneys are not the *only* organs that produce uric acid. On the other hand, there is definite proof that livers of geese are able to synthesize uric acid from ammonium lactate, although we are not certain that such an experiment is duplicated in the human system.

For the formation of uric acid, ferments are held to be responsible (Jónes, Brugsch and Schittenhelm), and of these the most important are the nucleases, desamidases (adenase, guanase), oxidases and uricase. Nucleases are responsible for the splitting of purin and the setting free of adenin and guanin, the desamidases split off the resulting amino group and oxidize the now formed adenin and guanin to hypoxanthin and xanthin respectively by means of adenase and guanase. The oxidizes then oxidize the hypoxanthin and xanthin to uric acid, and the uricolytic ferment (uricase) disposes of uric acid into carbonic acid and ammonia.

Two of these ferments are found in all tissues of the body—nuclease and desamidase—while oxidase is found in many. The uricolytic ferment, uricase, has been discovered in the kidneys and livers of lower animals, and it is probable that it also occurs in man (increase of urea after feeding nucleins). In the normal man the blood contains but traces of uric acid, probably not more than 0.8 to 1 mgrm. in 1,000 c.cm. blood on a mixed diet, although some say it is from 1 to 3 mgrm. per 100 c.cm. blood on a purin-free diet (Folin 1 mgrm. in 100 c.cm.). It circulates in the form of the mono-urate. This salt occurs in two forms known as the lactam and lactim, the former being unstable and the latter stable. The significance of these tautomeric forms is not clear.

From the above brief review it is learned that nucleins are broken down successively by specially designed ferments into uric acid, among other compounds, which is in turn broken up almost completely into carbonic acid and urea, only a small amount being excreted in the urine (between 0.4 to 1 grm.).

*Nuclein Metabolism in the Gouty.*—In gout, there is some disturbance of nuclein metabolism, and since the source of uric acid is the endogenous and exogenous purins, it is fair to presume for the sake of argument that the disturbances seen in gout are due to interferences with the metabolism of one or both forms of purin material. It must be frankly stated that so far as we know at the present time, there are no variations from the normal in the endogenous purin metabolism in gout, and so far as is known, the anabolic and catabolic series of reactions of endogenous nuclei acid are normally carried out in the subject of gout (Taylor). This does not deny the possibility of there being a retardation in reduction of uric acid oxidation, but this uricolysis is not, strictly speak-

ing, a part of the catabolism of purin. Gout is then a question of exogenous purin metabolism.

*Uric Acid Excretion.*—On a diet containing but little purin, there is, as stated, no change from the normal in the output of uric acid (endogenous), while on a purin rich diet, it seems that the exogenous purin exchange in the gouty is somewhat less than in the healthy, and the period of excretion is lengthened. Von Noorden believes that there are periods of deficient and periods of sufficient uric acid output, but that the excretion is retarded and diminished when the gouty paroxysm is established. To what these variations are due is problematical. There may be either a temporary diminished production of uric acid or a temporary inability of the kidneys to excrete uric acid, and the opposite holds true when there is an increased output of uric acid.

*Uric Acid in the Blood.*—There is always hyperuricemia due, not to increased formation of uric acid, but to some one of many factors. Among the most attractive theories concerning these factors are two. The one is, that the kidneys are impermeable, elimination is incomplete and uric acid accumulates in the blood by simple mechanical retention. There are certain objections made to this theory, among them being

(a) In gout, nephritis and blood poisoning (all associated with hyperuricemia), the total elimination of uric acid is normal in time.

(b) In gout associated with chronic nephritis, the kidneys are well able to excrete amounts of uric acid far above the upper limit of normal for several days following an acute attack of gout.

The second theory to explain hyperuricemia is that advanced by Brugsch and Schittenhelm—namely, that there is a deficiency of the uricolytic ferment, uricase, and less uric acid is broken up. As fascinating as this supposition is, it has by no means been proved to be true, and cannot be generally accepted until it is demonstrated that uricase, capable of splitting uric acid into  $\text{CO}_2$  and ammonia, occurs in human organs.

*Uric Acid in the Tissues.*—The local deposition of waters is an important feature of gout. Cartilage has the tendency to precipitate urates from solution *in vitro* from the blood in the gouty subject. Again we are confronted by the knowledge that in nephritis, leukemia, etc., such precipitation does not take place, although the blood has the same degree of saturation as in gout. Taylor says, "the moment or factor that determines the precipitation in cartilage of sodium urate from the blood in the subject of gout in contradistinction to other diseases in which saturation of the blood with sodium urate is equally present, is not known," although he presents arguments for gout having an unknown toxic basis.

We are come to the point in our erudition when we should like to be informed concerning the cause of the perverted nuclein meta-



bolism, with its resulting retarded catabolism of the total exogenous purins, and the production of hyperuricemia and local deposition of urates. We have nothing more helpful than theories, and in this respect we are no more enlightened than Sydenham with his humoral hypothesis.

Heredity seems to be an important predisposing factor, playing a rôle in about 50 to 75 per cent. of the cases of gout. Although women of gouty families oftentimes escape, they are more likely to transmit the disease to their offspring than are men. Men are more frequently affected than are women, and the disease attacks them in the fourth decade particularly.

Food, as believed by Sydenham, and even by Galen, is still held to be responsible for many cases of gout. Sydenham's view may again be quoted, "Great eaters are liable to gout, and of these the costive more especially."

*Uric Acid as a Cause of Gout (Uric Acid Theory).*—Granting that in gout there is a hyperuricemia, a fact so often proved that it is a fundamental truth, just how much of an etiological factor does it represent? Does the mere excess of uric acid cause gout? In lead poisoning, chronic nephritis, leukemia, as well as in gout, there is always hyperuricemia, and in pneumonia, septicemia, and following the excessive use of purins there is a temporary increase of the uric acid in the blood, yet gout does not develop. As regards the toxicity of uric acid it may be stated that (a) it may be given to animals in large doses and even injected intravenously without producing signs of intoxication; (b) it may be given to patients suffering with nephritis in amounts as great as three grams daily without ill effect; (c) it has no deleterious action on nerve muscle preparation. A chemical compound possessing such low toxicity seems scarcely able to produce such violent reactions as are seen in gout.

*Uricase Theory.*—As stated before, Brugsch and Schittenhelm have advanced the idea that there is an absence or deficiency of the uricolytic ferment which they claim is found normally in the liver, and whose function is to convert uric acid into allantoin. Attractive as this hypothesis is, it needs more confirmation before it can be generally accepted.

The injurious effects of alcohol are believed by some to be attributed to its interference with uricase, but as previously mentioned, this belief suffers by lack of proof of the existence of uricase in the organs of man.

*Sexual Glands.*—The rôle played by the sexual glands is imperfectly understood, and may be important, for gout is rarely seen before the sexual functions are mature, and it is even affirmed that gout does not occur in castrated individuals. In women, gout is

rarely seen before the menopause, but after this period, severe gout is experienced (Hall).

To nerve lesions has been ascribed an etiological factor, the nerve lesions being in the medulla oblongata, or other portions of the head. The influence of depressing conditions in precipitating an attack of gout lends some support to this view which is by no means abandoned to-day.

Lead poisoning and gout are at times associated, some believing that the metal produces chronic nephritis (retention of uric acid), and others that it has an injurious action on the nerve centres.

We finish our consideration of this subject by saying that although hyperuricemia and local deposition of urate classify the disease as gout, we are in no position to identify the cause or causes of these two phenomena. May it not be, that just as in diabetes, for instance, in which the cell nuclei seem to be unable to bring about the assimilation of carbohydrates, so it is in gout, that there is a defective metabolism of the nucleins, and that certain incomplete metabolites are formed, circulate, are retained, and only in part completely eliminated? We can conceive of an unstable nerve cell, and why not of a glandular or connective-tissue cell? All this fails to answer the main question, however.

*Rheumatoid Arthritis.*—Among the non-infective agents which are supposed to play a rôle in the etiology of arthritis deformans, the following may be mentioned. Perhaps the earliest theory was that which presupposed inflammatory changes of the muscles inserted about the hip-joint, the disease of the joint being secondary. The next hypothesis to catch the medical fancy was that the disease was a dyscrasia, closely allied to gout and chronic progressive poly-articular changes. This we know to be untenable, as there is no fundamental point of resemblance between gout and arthritis. Disturbed calcium metabolism has been suggested, as has also the idea that arthritis deformans is due to senile disturbance—*marasmus senilis*—plus a mechanical moment. Wollenburg (1910) has developed an ingenious theory of the causation on the basis of a permanent local disproportion between the arterial and venous blood-supply about the joint, generally arteriosclerotic in character. There may be either anemia or hyperanemia of the joint.

Many of the modern physicians, as well as the laity in general, assume that the disease is an expression of altered metabolism. Pemberton has recently championed this view in a painstaking and laborious research. He "had observed in certain instances the subjective benefit experienced by sufferers from rheumatoid arthritis after major operations and under certain other circumstances. It has also been noted by various observers that arsenic, thyroid extract and the exposure to the *x*-ray were sometimes helpful. A study of the metabolism of such cases under the *x*-ray showed an

increase in the elimination of nitrogen in the urine, which is also a feature of thyroid administration, and to some degree, of that of arsenic. If agents which hasten the general body metabolism, as evidenced by the nitrogenous interchange, are helpful in this condition, it is possible that the subjective benefits after operations are due to the lowered demands put upon the body by the depleted diet before and after operation, and in lesser degree to the 'destructive' metabolism or catabolism which results when the body utilizes its own tissues for support, as seen in its final expression during starvation. If this is true, it is conceivable that there may exist a midway point at which the economy is able to utilize the carbohydrates and proteids necessary for its bare sustenance without injury to itself, as evidenced in joint disease." (International Clinics, Vol. III, Series XXIV.)

In each case, Pemberton presupposes a limit of toleration for carbohydrates and for protein for each person beyond which it is dangerous to go, and below which, when maintained, the patient gets relief. His therapeutic results seem to him to vindicate his position regarding metabolic disturbances as causative in a certain number of cases. McCrae believes some patients are undoubtedly made worse by large amounts of carbohydrates, but thinks this due to intestinal disturbances, and adds, that the most reasonable view seems to be that any metabolic changes are a result and not a cause.

In the treatment of my subject I have purposely avoided giving in detail etiological factors, but have endeavored to present the most important of the numerous opinions advanced to explain the causation of gout and rheumatoid arthritis, the most important of the so-called rheumatic conditions. At this, the conclusion of the paper, retrospect shows that the speaker has given no definite information concerning the non-infective causes of rheumatism and allied conditions. He has detailed numerous theories, all of which led him to state that at the present time we have no knowledge of the true etiology of these diseases.

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## THE PINEAL GLAND.\*

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By CAREY PRATT MCCORD, M. D., of Detroit.

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## INTRODUCTION.

The animal body is controlled by an interlocking directorate. This directorate is made up of the glands of internal secretion. The derivatives of these glands regulate and correlate many of the body's functions and protective measures. Their influence is exerted on resistance to infections and intoxications, on nutrition and organic metabolism, on growth and decadence, on intellectuality and temperament. To this directorate the pineal body is but guardedly admitted by some and by others is flatly rejected as insignificant as an organ of internal secretion. Recent investigators would attribute to the pineal body functions heretofore hidden in the obscurity that to some extent still surrounds the ductless glands and their functions. As knowledge extends regarding this vestigial organ, its metamorphosis is a noteworthy thing. What is now the pineal body (pineal gland, epiphysis, conarium) was probably in earlier evolutionary stages a parietal eye or pair of eyes. As environmental conditions were altered, it ceased to functionate and lost all connection with the visual mechanism of the brain. Only in a few species of lizards does this organ approach functional activity. In the embryonic state of these animals distinct lenticular and retinal areas may be observed. In higher animal life, at the present time, the most suggestive indication of an earlier ocular function of the pineal is the melano-pigment found in abundance in many pineal glands. This is probably a vestige of what in an earlier time corresponded to the choroidal coat of the present eyes. Although the pineal is no longer of use as a visual organ, it cannot be said to be merely a rudimentary body or vestige such as Starling describes when he wrote "the pineal gland has, as far as we know, no functions in metabolism. It is interesting as a vestigial remnant of a primitive dorsal eye." To the contrary, evidence is accumulating that is indicative of a marked influence exerted by the pineal gland upon somatic, mental and sexual development.

It is the purpose of the present paper to group together the essentials of the literature bearing upon this organ. It is not an ex-

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\*From the Research Laboratory, Parke, Davis and Company, Detroit.

haustive, critical paper, and as far as feasible the technicalities of the various investigations have been omitted.\*

#### ANATOMY AND HISTOLOGY.

The pineal gland is situated in the brain just beneath the splenium of the corpus callosum. In the human its shape is nearly trilateral. The base is anterior and directed forward over the third ventricle. The base is attached to the habenular commissure and to the posterior commissure overlying the entrance into the Sylvian aqueduct. Between the habenular and posterior commissures a small pointed diverticulum, the pineal recess, extends from the third ventricle for a very short distance into the pineal body, and thus recalls the early condition in which the organ is developed as a tubular outgrowth in the roof plate of the diencephalon (Piersol). The apex of the gland extends backward and downward and is suspended between the anterior quadrigeminate bodies.

Bailey and Jelliffe,<sup>1</sup> in summing up the anatomy of the pineal gland, point out its significance as a causative factor in intracranial pathology. "It thus lies close to the communications between the third and fourth ventricles, to the cerebellar and pontine spaces, and is in direct contact with the large venous channels that drain the central region of the brain. Hence, in enlargements of the pineal, circulatory disturbances will develop first, with the formation of varying degrees of hydrocephalus. Often the hydrops develops with great rapidity, though it may do so very slowly, and is undoubtedly conditioned by at least two independent factors—namely, pressure on the veins of Galen, and obstruction to the aqueduct of Sylvius. Then again, there are reasons for believing that growths in this region further stimulate the production of cerebrospinal fluid, in which case an additional factor for hydrocephalus development comes into consideration."

Histological studies have in the main been prosecuted toward establishing (1) the presence of glandular tissue; (2) the presence of contractile tissue supporting the view that the gland is a valve regulating the flow of cerebrospinal fluid; (3) nerve fibre communication between this gland and other parts of the brain; (4) evidence of involution changes in the gland indicating a cessation of function.

It would appear that there is acceptable evidence of the glandular nature of the pineal. It is to be admitted that the glandular elements are scant and ill defined. Biedl's<sup>2</sup> description of the pineal's histology is essentially that of glandular organs. "In newborn in-

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\*The writer has freely used the review published by Kidd in the *Medical Chronicle*, December, 1912. This is an exhaustive paper and embraces many phases of study of the pineal gland that the scope of the present paper does not permit. It is especially thorough in its review of studies upon the pineal's anatomy and histology.

phants the pineal gland consists of irregular lobes held together by a small quantity of connective-tissue; *the lobes are composed* of cells of almost the same type, but arranged irregularly, being crowded together in the interior of the organ. The pineal cells have a pale, tinted protoplasm and very characteristic nuclei, these being large and oval, and crowded, over their entire circumference, with granules. Dimitrowa distinguishes four different nucleus forms. Other important histological details are (1) the peculiar nature of the ependyma of the recessus pinealis, in which cubical epithelium and epithelium composed of goblet-like cylindrical cells alternate; and (2) the cysts which are observed at the base and in the interior of the pineal gland of newborn infants, and which probably represent obliterated blood-vessels. The pineal gland shows signs of involution before the age of puberty, the first symptoms being observed in the seventh year. The concretions known as pineal sand or acervulus, which consist of calcium phosphate and calcium carbonate, are found in the glia layer which covers the commissura habenularum. As age increases, a distinct increase of the connective substance at the expense of the glandular tissue takes place. The glandular lobes are replaced by plaques composed of connective-tissue and a very fibrous glia tissue, and these plaques contain isolated glandular cells. The connective-tissue septa further undergo hyaline degeneration, and may completely calcify. Occasionally, homogeneous masses are observed in the septa or in the interior of the glandular lobes, and, after the deposition of calcium salts, corpora arenacea are evolved from them. The glandular cells also present signs of involution, but even in extreme old age glandular cells are encountered which are intact and apparently still functionally active."

Jordan,<sup>3</sup> in 1911, published the results of his work on the histogenesis of the pineal gland of the sheep. He studied the gland at various stages from 2.5 c.cm. embryo to old sheep. Of the gland at full term he writes, "The specimens in hand lack about a week of full term. However, the pineal bodies are in all respects, except size and number of granules, like those of lambs (each eight months). They contain numerous alveoli of varying calibre and length, and considerable of the cells contain small amounts of melanic granules. The characteristic new feature here is the great abundance of follicular arrangements of cells about central vascular connective-tissue trabeculæ. Since all of the features of the adult pineal gland are here present and in less complicated form, it seems desirable to describe them more in detail.

"The body simulates a lobulated gland. The lobules are delimited more or less distinctly by coarser and finer reticular septa or vascular connective-tissue continuous throughout, and peripherally, through the coarser trabeculæ, with the pia mater. The



lobules consist of one or several follicular aggregations of cells. These are spherical or oval masses, the parenchyma of which consists of two distinct types of cells with several intermediate types. The framework of the parenchyma is a reticular structure of delicate neuroglia fibres, for the most part continuous with the irregularly polygonal and flattened stellate neuroglia cells. Many of the coarser fibres seem entirely free from the cells, as in typical neuroglia tissue. The second main type of cell, oval and spheroidal or polyhedral, occupies the interstices of the neuroglia meshwork. Many of the cells still contain numerous melanic granules, more especially peripherally and in the walls of the alveoli or cysts. The latter are still abundant and quite large.

"A conspicuous feature is the great vascularity of the pineal body. Frequently, capillaries terminate in the form of tangled loops or 'glomeruli' within spaces surrounded by more compact parenchyma. Such spaces in some cases represent alveoli into which a trabecula has carried blood-vessels. It remains to note that both the parenchyma and neuroglia fibres are more abundant peripherally. The latter also are coarser in this region. The entire body, exclusive of the vascular pial trabeculae and a few white nerve fibres, is composed of more highly differentiated or interneuroglia cells of the original ependyma of the third ventricle."

Cajal,<sup>4</sup> in 1895, demonstrated sympathetic nerve fibres in the pineal. The axons form a plexus in the vicinity of the glandular cells, but the terminal nerve twigs do not penetrate the cell protoplasm. This is the nerve fibre and gland cell relation in other secreting organs. Polvani,<sup>5</sup> in 1913, basing his deductions on the histological study of the human pineal gland, at various periods of development, denies that this organ is of a nervous or lymphatic nature; he admits the existence of neuroglia tissue, but he attributes to it only a secondary importance, relative to the principal cells in which he recognizes the glandular character. The gland nature of the pineal is denied by many of the earlier modern writers. There are adherents to the belief that the organ is only a lymph ganglion; others that it is pure neuroglia, etc.

The occurrence of muscle fibres in the pineal body would attach significance to the valve action of the pineal in regulating the flow of fluid through the aqueduct. Nicolas<sup>6</sup> found striped muscle fibres in the pineal from cattle. These fibres are few and scattered. Dimitrowa<sup>7</sup> confirmed this finding, but otherwise there has been no substantiation of this. Illing,<sup>8</sup> in 1910, reported the occurrence of non-striated muscle fibres in cattle, but Jordan, in 1911, was unable to find either striated or non-striated fibres. So also Funkquist,<sup>9</sup> in 1912, failed to find muscle fibres in the pineals from hen, duck, diver, canary, sparrow, ox, pig, rabbit, rat, hedgehog, cat. This

writer is of the opinion that the muscle fibres described by others are only 'myoid' forms of neuroglia.

In such reptile forms as have a pineal body retaining in some measure its original function, well-defined nerve fibres are demonstrable. In the human, according to Piersol, apart from a few nerve filaments in the anterior part, probably sympathetic in origin and destined for blood-vessels, and a dense network of neuroglia fibres, the gland contains no nerve elements.

As early as 1854, Faivre<sup>10</sup> recognized that the gland in childhood and in adult life is histologically different. Involution changes are attested to by workers both in animals and in humans. In children (Krabbe) the gland attains to its greatest activity by the seventh year. From that time on, involution changes are discernable. These retrograde signs are described by Krabbe as connective-tissue proliferations, concretions, cysts, neuroglial plaques, cells of disintegration. The gland is, however, very stable, and this lends significance to a function for the adult gland. The involution signs at ninety-two are no more pronounced than at fourteen. In only one case did this investigator find complete degeneration. From his histological studies he is inclined to believe that in adult life the gland functionates.

Jordan's paper, dealing as it does with successive stages of the sheep's pineal, indicates these degenerative signs: "Pineal bodies of sheep of the third year are characterized by several degenerative changes, viz., (1) great increase in the connective-tissue elements; (2) large and numerous areas of dense neuroglia network free of cells; (3) areas of apparently coagulated fluid matter; (4) large clumps of intercellular pigment granules in the peripheral portion; (5) comparative rarity of spherical interneuroglia cells. The histological characteristics point to a cessation of active function and to the onset of degeneration. Judging from the standpoint of histological and cytological features, the assumed specific function of the pineal gland is important, perhaps essential, only during the first year of life."

*Summary.*—Cytological studies, prosecuted under the best conditions and extending over successive stages of development in several species, lend support to the contention that the pineal body is glandular in its nature. The gland elements are few and ill defined. Neuroglia and nerve fibres are to be found at least in certain animals, but these are probably of secondary importance. The gland undergoes involution changes, beginning in the human as early as the seventh year. The degeneration is not complete, and the histological picture of the adult gland is not such as to remove the possibility of a physiological function of the gland in adult life.

## EXTIRPATION EXPERIMENTS.

In the study of the pineal body's functions, the changes concomitant to the gland's removal have frequently been under observation. No other gland is removed with so great difficulty. Attempts to remove the gland have been frequent, but injury to the vermis or occipital lobes, or hemorrhage from the venous sinuses, has led to death of the animals in by far the greater number of instances. By operating on a large number of animals, several workers have had a few animals survive the severe traumatic procedures. Growing out of these studies a number of papers are available describing the technique of pineal extirpation and the function of the gland as manifested in changes following the gland's removal. Unfortunately, the findings from the several investigations are by no means in harmony. A complexity of factors contributes to this divergence of opinion. Among these vitiating factors, interfering with the proper interpretations of results due purely to pineal removal, are first, body changes due to the severe operative process necessary for the gland's removal; second, the comparison of results obtained from adult animals with those from young animals; third, on incomplete removal of the gland, inflammatory changes in the remaining functional part may increase the secretion of the pineal substances. Results from the experimental extirpation of the gland should lead to the answering of such questions as (1) Is the operative removal of the pineal gland in animals feasible? (2) Is the entire gland or a part essential to life? (3) What immediate changes occur on its removal? (4) If not essential to life, what remote changes occur, such as alterations in the general metabolism or disturbances in the other endocrinous organs?

Our knowledge regarding such phases of pineal functions as may be determined by extirpation is largely based on the papers here briefly reviewed.

In 1910, Sarteschi<sup>11</sup> attempted the destruction of the pineal with the cautery. The animals employed were rabbits, and no changes followed the application of the cautery to the gland. Likewise, Exner and Boese<sup>12</sup> applied this method in part of their experiments on rabbits and likewise obtained negative results. In some of Sarteschi's rabbits the gland was removed with the knife. Only two of these animals survived. They became much emaciated, and although in pens with males they did not become pregnant. This worker, in 1913,<sup>13</sup> however, reports the production of the macrogenito-somatic syndrome in young rabbits and puppies. Inasmuch as the original paper is not available to the present writer, an abstract by Kidd is in part here used.



Sarteschi has now obtained this syndrome (precocious macrogenito-somatic) by experimental pinealectomy in very young rabbits and puppies, as Foa did in cockerels. Sarteschi attempted it also in very young kittens but with constantly fatal results. He used the operative procedure of Lo Monaco—namely, ligature. This obviates the risk of hemorrhage. A temporary ligature of the carotid artery gives an anemic field of operation. Out of 23 rabbits operated on at the age of about forty-five days, 3 only survived; a small remnant of the pineal body was found on autopsy, and the testes were greatly hypertrophied, as in Foa's cockerels. The rabbits had, up to the time of their death (at the age of five to seven months) grown much more than the controls of their own age. All the organs and internal secretory glands were normal. Sarteschi concludes that in rabbits pinealectomy, whether it be complete or incomplete, determines a great bodily development, sexual precocity, and a notable enlargement of the testes. In puppies the operation is more difficult; out of 27, only 5 survived. Operation took place at the age of two months. Substantially the same results followed as in the rabbits. The testes of one puppy were of adult size before he was five months old; on autopsy they were histologically normal. Another male puppy showed, at the age of five months, great size and adiposity and enlarged testes. In conclusion, Sarteschi accepts Pellizzi's hypothesis that the pineal body exercises a moderating action on genito-somatic development.

Foa, in 1912,<sup>14</sup> after extensive preliminary work, from which he decides that the rabbit is wholly unsuited for pinealectomy, directs his attention to pinealectomy in young chicks and reports the production of precocity in body and sexual development in young cocks. The glands were removed from the chicks at about one month of age. The mortality percentage was very high, only 25 per cent. of his animals surviving. The females of the series evinced no indications of any changes due to pinealectomy except the retardation in growth during the first two or three months subsequent to the removal of the gland. The three young cocks, according to Foa, after eight to eleven months, showed excessive growth of combs and testes and exhibited indications of greater sexual activity. Although the number of animals under observation in this work is small, the communication is a valuable one and represents careful insight into the problems of the experimental study of the pineal gland.

The most recent publication relative to extirpation experiments is another by Foa.<sup>15</sup> These new experiments upon chicks and rats are reported by Foa to substantiate his earlier claims as to the pineal's functions. He thus summarized this recent work: "The new experiments on the extirpation of the pineal gland in the young male chick confirm the result which I previously obtained,

that the operation is followed by a development of the testes and the crest greater than in the non-operated control cock. The difference begins to manifest itself five months after the operation and increases constantly up to the ninth month. The operation produces no effect on the general development of the body in the fowl.

"The extirpation of the pineal gland, in the very young rat, produces no appreciable effect in the female; in the male it provokes a more rapid somatic development and the maximum difference is observed, between the weight of the operated animals and the controls, twenty-six to thirty days after the operation. Then the weight of the operated animal gradually becomes equal to that of the control.

"At the moment when the difference in weight reaches the maximum, one observes also a markedly greater development of the testicles in the operated animal. The difference in the testicles disappears when the weight of the body becomes equal.

"The histologic examination of the testes, in the cock as well as in the rat, at the time of maximum difference in volume, reveals a uniform development very advanced in all of the tissues of the gland; the diameter of the canaliculus is increased, the opening enlarged; the mass of spermatozoa which fills the canalicular opening is greater; the canaliculi are more separated from each other and consequently the interstitial tissue shows greater development. There is no difference in the spermatogenetic process, if one excepts the quantity of spermatozoa which fills the larger opening of the canaliculus.

"The canalicular tissue and the interstitial cells being uniformly more developed in the operated animal, it is impossible to say that to any of these tissues is due the greater development of the secondary sexual character in the cock and the somatic development in the rat.

"The experiments on the rats have shown that the extirpation of the pineal gland does not determine an absolute hypertrophy of the testes, but a premature development of them. Forty-eight days after the operation, the operated rat cannot be distinguished from the control. This observation confirms the theory which attributes to the pineal gland an inhibiting function in the sexual development; we learn from this that with the beginning of puberty there coincides an involution of the pineal gland."

Dandy<sup>16</sup> is cited by Cushing as having removed the gland from dogs. The age, whether puppies or adults, is not stated. No recognizable changes attended the gland's removal.

Biedl writes in regard to his work in removal of the pineal gland: "I have occupied myself for some time with experiments, the main object of which has been to determine the clinical results of pineal

suppression. I have succeeded, so far, in extirpating the pineal gland by a method similar to that which I employed in hypophysectomy. As far as my observations go, the pineal gland in the adult animal is a negligible quantity; my experiments with young animals are not as yet complete."

*Summary.*—Some of the questions asked in the preceding paragraphs are now answered by the work just cited. The removal of the gland is surgically possible. In experimental work this frequently has been done, but the trauma is great and death occurs in a large majority of cases. The removal of the gland in clinical cases, while possible, is attended with severe risk and is not to be considered as a probable form of treatment under any except unusual circumstances. The gland is not necessary for the maintenance of life. The early symptoms ensuing after operation are probably concomitant to the traumatism. No changes attend the removal of the gland in adult animals. As to the effects of removal of the gland in young animals, some dispute has arisen. Sarteschi and Foa respectively state that the gland's ablation leads to precocity of development. Certainly no experimental results are so complete as to allow comparison with the very striking syndrome seen clinically.

#### CARDIO-VASCULAR STUDIES.

Studies of the relations between the circulatory system and endocrinous glands have yielded instructive and valuable results bearing upon the nature of the derivatives of several of the glands, notably the adrenals. Such studies carried out with pineal extracts have led to contradictory conclusions in some respects. For the greater part, the results are of physiological interest rather than of utilitarian importance. Howell,<sup>17</sup> in 1898, was the first to make intravenous injections. A few injections of pineal extracts were made as controls in experiments upon the action of pituitary extracts. Apparently no significance was attached to these experiments by Howell. Von Cyon,<sup>18</sup> in 1903, using rabbits as subjects, made a study of pineal extracts. This worker reports that extracts are without demonstrable effect upon the blood-pressure. With small doses he obtained a rapid and feeble pulse which he attributes to the presence of inorganic salts in the gland. At the time of this publication, von Cyon concluded that the pineal function was purely a mechanical one serving to control the flow of cerebrospinal fluid through the aqueduct. Dixon and Halliburton,<sup>19</sup> in 1909, in their experiments of this type employed a preparation of desiccated sheep pineal gland. The dried glands were extracted with various reagents and injected intravenously into cats. Very small doses were employed, and with such small doses but scant alterations in the cardiovascular system were observable. Al-



though a transient fall in pressure of blood occurred following their larger doses of this dilute extract, no changes are reported by them as occurring in the heart, respiration, intestinal volume and kidney volume. Ott and Scott,<sup>20</sup> in 1912, in several of their papers on internal secretion refer to experiments with pineal glands. Noteworthy are their observations that pineal extract induces vasodilatation in the erectile tissue of the generative organs of the male cat, stimulates the contraction of the intestinal wall and uterus, produces a diuresis and glycosuria, and increases the activity of the mammary gland.

By far the most exact study of cardiovascular changes subsequent to pineal extract administration has been made by Jordan and Eyster<sup>23</sup> in 1911. The material employed was sheep's pineal glands, either fresh or preserved in alcohol or formaldehyde. The amount constituting a dose was usually the extract from one gland given intravenously. Their own summary here appended gives the scope of their work and their conclusions:—

“Our experiments indicate that the pineal gland of the sheep contains some substance (or substances) which, on intravenous injection in certain animals, cause a fall of blood-pressure associated with a vasodilatation in the intestines, produce a slight degree of improvement in the beat of the isolated cat's heart, and cause a transitory diuresis associated with glycosuria in about 80 per cent. of the cases. We have found, in agreement with Dixon and Halliburton, that the effect on blood-pressure in the cat is small and unimportant. It should be noted that our extracts were in all cases more concentrated than those employed by these investigators. On the whole, our work would seem to indicate that while certain definite effects on the circulation and secretion of urine are produced in certain animals as the result of intravenous injections of extracts of the pineal body, the action is relatively slight when compared with that produced by extracts from other glands known to furnish internal secretions.

“Our experiments deal obviously only with a possible rôle of the pineal body in producing certain relatively rapid effects on the circulation, respiration, and secretion of urine. They leave entirely untouched the possibility of more gradual effects over longer periods of time, as well as the influence these bodies may exert on metabolism or other functions and their relation to other organs of internal secretion.”

In Dana and Berkeley's<sup>25</sup> paper, 1913, which will be considered in further detail in the section on feeding experiments, reference is made to some cardiovascular studies. The following is a quotation summarizing their findings:—

“The blood-pressure experiments were virtually negative. Two dogs were used. The first dog received in rapid divided doses, in-

travenously, a concentrated solution of the nucleoproteid extract of 30 calves' glands. There was no response. The same animal then received intravenously 2 oz. of the globulin-albumin content of the same glands—without result. The second dog received a concentrated filtered saline solution of 24 bullocks' pineals, with no essential response."

The present writer has carried out 20 animal experiments in which pineal extract was intravenously injected into the jugular of dogs anesthetized with chloretone. The pineal extract was made up from fresh glands by grinding in a mortar with saline. The usual dose was one gland in 2 c.cm. of saline maintained at body temperature. In striking contrast to the results just quoted above, some of our dogs were killed by a single injection of one gland in saline. The phenomena associated with the injection and subsequent effects were a rapid fall of blood-pressure, depressed and irregular heart, intense venous engorgement, death in from one-half to one minute. Smaller doses produced less intense results and many animals survived a dose of two or more glands prepared in the same manner as above. These cardiovascular changes occur equally intensely from glands from calves and from older cattle.

*Summary.*—The immediate results attending the intraveonus administration of extracts from the pineal gland are not usually pronounced. Such phenomena as a decrease in arterial tension, dilatation of the blood-vessels, altered rate and amplitude of the heart beat, diuresis, glycosuria, increased mammary secretion, have been reported and confirmed. The intensity of these several activities is so slight that up to the present time only technical importance may be attached to these findings.

#### THE ADMINISTRATION OF PINEAL GLAND TISSUE.

Contrary to the current belief that the pineal gland functionates by holding in abeyance too rapid somatic, sexual and mental development in early life, are the recent experiments tending to show that feeding of pineal substance to young animals induces very similar changes. Observations have not been confined to animal experiments, for in cases of mental deficiency in children treatment with pineal gland substance has proved of value in increasing the intellectuality. In the animal experiments reported by Dana and Berkeley,<sup>24 25</sup> and by McCord,<sup>26</sup> the noteworthy difference was in the rate of growth of body of pineal-fed animals over controls. It is remarkable how small an amount of pineal gland will, when administered orally, produce a more rapid growth of the body over controls, from the same litters or broods. So small an amount as 20 mgrm. weekly will stimulate growth beyond the normal rate. A large series of experiments aggregating 250 animals have uniformly shown the same result. The

pineal-fed animals grew faster and were more resistant to infections. This growth was never beyond normal adult size. It was impossible to produce gigantism. In breeding experiments (McCord) it was observed that the pineal-fed females gave birth to young earlier than their controls. This cannot be taken to mean that the gestation period was shortened, but apparently indicates that sexual maturity is attained earlier by the pineal-fed animals.

In a recent series of experiments (48 guinea-pigs) the present writer administered the pineal substance in sterile solution hypodermically. The glands for this material were removed from calves' brains under aseptic conditions. It was so prepared that 1 c.cm. represented 20 mgrm. of a fresh pineal gland. Of this,  $\frac{1}{2}$  and later 1 c.cm. constituted a dose. This was administered three times weekly. The controls were given in the same manner an equal amount of brain tissue. The body growth resulting was even greater than for oral administration. At the end of the first week the pineal animals had more than doubled the gain of the controls. Continuing this for six weeks, the average gain in excess of controls was 26 per cent.

It is not easy to draw the separating line sharply between the defective and the normal child. Between the normal child and the child hopelessly mentally deficient through gross anatomical anomalies, there exists a class so large as to embrace 1 per cent. of all children of school age in this country. As pointed out by Berkeley and others, there are no physical stigmata in the make-up of many of these children to indicate any defect. They are many times beautiful children, well proportioned, with well-shaped heads and limbs and normal eyes. The retardation that comes from adenoids and tonsils, although common in this class of children, can be ruled out in many cases. After the elimination of the cases attributable to such conditions as gross anatomical defects, adenoids and tonsils, hereditary syphilis, malnutrition, starvation, vicious environment, uncinariasis, etc., there remains a large number that to the trained mind of the teacher or medical observer may be characterized as 'backward, dull, stupid.' It becomes more and more evident that the glands of internal secretion are frequently etiological factors in these disorders. McCready<sup>27</sup> emphasizes that not one gland but the entire system of glands is inefficient in these cases. He lays stress on the vitiating influence on embryonic development of tuberculosis, syphilis, cancer, chemical poisons, malaria, alcoholism, drug habits, insanity, goitre, malnutrition and various environmental conditions of the progenitors. As a result, there appear the conditions of infantilism, degeneracy, hypoplasias, idiocy, etc., in varying degree. A more extensive review of the literature of this matter emphasizes the plausibility of attributing some of the types of mental deficiency to glandular irregularities. It will be found,



however, that organotherapy has by no means been uniformly successful. In the hands of some, excellent results have followed the administration of polyglandular or monoglandular preparations.

Recent work has attached importance to the pineal gland as a stimulator of mental activity. The precocity of mental development found in some clinical cases of pineal tumors is sufficient to associate this gland with an influence upon mental activity. Dana and Berkeley, after a long period of preliminary experimentation as to dose, toxicity, etc., prescribed pineal gland substance for children of low grade mentality. Fifty children were so treated and these were carefully controlled with other children of the same age, sex and diagnosis; Binet tests were made the criterion of mental advancement. There was no immediate rapid body growth, but on continuing the treatment over a long period, the mental development was greater than prior to the treatment and in excess of controls of the same mental age. In individual cases, the results were striking. It is significant that only glands from young animals were active, and only in young children, below fifteen, were results obtained. This treatment has been repeated by others with good results. As to the mechanism of these changes, little can be said apart from speculation.

*Summary.*—The administration (orally or hypodermically) of pineal gland tissue is reported to induce developmental changes similar to those usually associated with pineal gland deficiency. In young animals the most pronounced effect of pineal administration is a rapid growth of body, but children of low mentality when treated with such material do not exhibit rapid body growth but do improve mentally. Only young children (up to twelve or fifteen years) are influenced by such treatment.

#### PINEAL NEOPLASMS AND RESULTING FUNCTIONAL DISTURBANCES.

Tumors of the pineal gland are not of frequent occurrence. The total number of authentic cases is not more than 70. These cases with subsequent necropsy findings have been the source of the greatest amount of information as to the functions of the pineal gland. With tumors involving this organ two systems of signs and symptoms may be associated—the neurologic and the metabolic. These tumors may occur at any age of the patient, but the symptomatology varies with the age of the patient. In adults only the neurologic signs and symptoms occur. These are manifestations of encroachment upon the intracranial contents and are indications of changes in pressure, in position, and of destruction of tissue. In children, however, a second group of symptoms and signs may arise—the metabolic. Such changes are the outcome of disturbance in the gland's secretory function. This syndrome appears to be more complete in young males, but it cannot be said to be confined to

young males. This syndrome due to perversion of pineal function consists first, of early sexual maturity, evidenced in the enlarged sex organs, pubic hair, general body hair, early change in voice; second, precocious mental development evidenced in the maturity of thought and speech; third, general body overgrowth to the extent that a child of five or six years may have the appearance of a child of eleven or twelve. The syndrome is rarely complete, and all considered only about 10 per cent. of the 70 cases present metabolic changes that may be associated with pineal function. Inasmuch as this is not an exhaustive review, the very interesting case histories of these patients cannot here be included. A detailed and accurate review of the clinico-pathologic material may be found in the publication by Bailey and Jelliffe. Since the appearance of their paper a few new cases have been reported. The patients were adults manifesting no metabolic symptoms attributable to the pineal gland functions.

On perusing the cases cited in the available reviews, it is at once evident that the metabolic changes associated with functional activity of the gland are confined to prepuberal life. Many cases of pineal tumors below puberty manifest none of the signs of precocity of development that are so striking in a few selected cases. A study of the clinical material reveals how little consideration has been given to the possibility of pluriglandular involvement. In fact, in most cases the necropsy demonstration of a pineal tumor led to the association of all prior metabolic changes to pineal functional perversion. This grew out of the prevalent conception of each endocrinous gland as an entirety entering into no interrelations with other similar organs. Judging these cases in the light of recent advances in pituitary pathology and physiology, it is difficult to delineate the manifestations of pure pineal derangement from the manifestations that almost inevitably must be connected with a pluriglandular condition. Cushing has pointed out that from the intracranial alterations attending pineal neoplasms, the hypophyseal functions are usually deflected from the normal.

Precocity of development when it does appear in tumor cases has long been attributed to deprivation of the body of the substances elaborated by the gland because of destruction of the gland by the neoplasm. As has been noted in the section on pineal extirpation, results from Foa and Sarteschi bear out this contention. These considerations led to the belief that the pineal gland functionates by holding in abeyance the rate of body growth, and the development of the mind, and of genital organs and functions. In some recent experimental work, which is reviewed in another section of this paper, a similar precocity of development from feeding pineal gland to young animals is reported. This unfortunately injects confusion into an already intricate situation. On the basis of ascribing precocity of

development to pineal deficiency it would be anticipated that pineal feeding would lead to a retarded development and late maturity. The reverse was the actual outcome. It was found that administrations (orally or by hypodermic injections) of minute quantities (as little as 20 mgrm. weekly) led to rapid body development, early sexual maturity, enlarged testes, increased mentality. Out of this arises a very perplexing situation. It would appear that the experimental removal of the pineal gland or destructive tumor of the gland leads to the same results as does feeding or injecting the pineal material. The question arises, may the precocious macro-genito-somatic syndrome not be a manifestation of hyperpinealism rather than hypopinealism? In the publications by Marburg<sup>28</sup> and Polavani there is a tendency toward attributing to the pineal a constructive stimulating function. The former attributes all pineal adiposis to hyperpinealism and to him the true picture of apinealism is cachexia. The condition of cachexia in pineal tumor cases is of sufficient frequency to lend some support to the above contention. In cases of complete destruction of the pineal gland reported by Ogle, Nieden, Gowers, Massot, Nothnagel, Forster, cachexia, especially in the final stage, was the paramount sign of the condition. This cachexia is at times preceded by adiposis.

Polavani deprecates the findings from experimental extirpation of the gland. He points out the extreme difficulty of complete removal of the gland by operation. Contradictory findings, at the hands of several workers may be due to the leaving behind of portions of the gland. Sarteschi reports that on autopsying his animals, subjected earlier to pineal extirpation, portions of the gland were found to have been left behind. In other work, the portion of the brain excised by operation has been sectioned and stained and has been found to represent the entire gland. While portions of the gland are undoubtedly left behind and under the whip of inflammatory processes may be unusually active, any wide generalizations are, in the presence of so few facts, unjustified.

In an effort to harmonize the production of similar changes by two opposing causes, the destruction of the pineal gland on the one hand and the administration of the gland substance on the other, there arise two possibilities worthy of further work. First, the precocious macro-genito-somatic syndrome may result from disturbing the general endocrinous balance either by increasing or decreasing the amount of pineal secretion available for the body's use. Bearing upon this is the writer's observation that feeding of pineal substance to male guinea-pigs leads to a hypertrophy of the testes with a microscopic picture similar in some respects to that recently described by Foa as occurring concomitant to glandular extirpation. Second, the cells of the neoplasms involving the pineal gland may retain some of the metabolic and other functional



characteristics of the normal pineal cell from which they were derived, and the peculiar body, sexual and mental changes in patients with such tumors are all manifestations of increased rather than decreased pineal activity. There is abundant evidence that at times cells of tumors functionate after the manner of the cells from which they arise. In adenoma of the liver, in cases reported by Weber,<sup>29</sup> Rolleston,<sup>30</sup> Wheeler,<sup>31</sup> and Ribbert,<sup>32</sup> distinct bile secretion by tumor-cells has been pointed out. Ribbert established that the bile present in such tumors was not the bile of icterus from necrotic liver-tissue by demonstrating that the scirrhus encapsulating tissue was free from bile stain and that the bile was confined to the liver-like cells of the active tumor. In at least one case, a metastasis in the lung from the liver secreted bile. In this connection it is significant that the functioning glandular cells of typical thyroid structure have been found in thyroid metastases in bone-tissue. Furthermore, in myeloma of the bone-marrow the cytoplasm<sup>33</sup> of the tumor cells contains the granules that characterize normal myelocytes, that is, the tumor to a certain extent assumes the function of the bone-marrow. All considered, it is perceived that functional activity of tumor-cells is not infrequent. Germane to the present contention is the statement of Hinds Howell<sup>34</sup> in describing the characteristics of the cells of the pineal tumors of his 3 cases. He says: "A noteworthy feature is the similarity of these tumor-cells in many instances to those of the normal pineal gland."

*Summary.*—Neoplasms of the pineal gland are rare and only a low percentage of authentic cases have shown the results of derangement of the gland's secretory functions. The precocious macro-genito-somatic syndrome is only found in the prepuberal age and is more complete in young males than in females.

Manifestations of unusual development in patients with pineal tumors have in most instances been attributed wholly to perversion of the pineal's functions. In the light of recent advances there are many indications of a pluriglandular involvement in some cases. Divergent findings in these cases are made more harmonious by considering the influence that other glands may exert in the production of the clinical picture. The hypophysis is very likely to become involved.

Whether neoplasms of the pineal retard (hypopinealism) or increase (hyperpinealism) functional activity, is a matter of divergent opinion. Experimental evidence is available, supporting either contention.

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## EPILEPSY IN YOUNG ADULTS AND ADOLESCENTS, WITH REFERENCE TO A NEW TREATMENT BASED UPON PATHOGENESIS.

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*Some Pathological Features.*—It is supposed that a special irritability of the cerebral cortex is a prerequisite to the manifestation of epileptic convulsions. In favor of this hypothesis are invoked many facts. In the first place, it is frequent to find in the ascendants or collaterals of epileptics either epilepsy itself, or some other dyscrasia, often showing itself through the nervous system, whether in the life of relation, by irritable or violent temper, eccentricity, feeble-mindedness or what is loosely called neurasthenia and hysteria, or in the vegetative life itself as by a feeble body, of poor resistance to tuberculosis and acute infection, an addiction to drugs like alcohol, or an incapacity or unwillingness to work steadily or hard.

When analyzed, these facts do not prove that the cerebrum itself is degenerate, for this interpretation does not take into account the bodily determinants of cerebration, such as respiration, circulation, the metabolism of food, and the internal secretions, the disorder of any of which seriously impairs cerebral function.

The writer will not enlarge upon this fruitful theme, for experienced clinicians will appreciate its importance at once, while for others a treatise would have to be written.

A second fact often used to support the hypothesis that epilepsy is a disorder of the cerebrum is its onset after injury or disease of the brain, such as is produced by tumor, sclerosed neuroglia or vessels.

Even here we cannot in justice dogmatise, for we know that not every arteriosclerosis, cortical tumor, or blow on the head gives rise to convulsions by any means. So that we cannot, without specific investigation, exclude the likelihood of parabolic products being the real producer of the convulsions which occur. That such is the case, even in these patients, we have no proof, it is true, but presumptive clinical evidence offers itself. The case which follows is a common enough type to give good illustration.



*Epilepsy from Vascular Cerebral Lesion Removed by Metabolic Means.*—A man of sixty-four, chief architect in the Indian Service, consulted the writer February 10th, 1910, having been sent by Dr. Philip Roy, because of the recent occurrence of epileptiform convulsions with loss of consciousness.

The first attack had occurred in May, 1909, at an elevation of 12,000 ft., near Durango, while he was inspecting the school buildings there. He was unconscious for half an hour. The second attack occurred shortly after, upon leaving the train in Chicago, while going to the staircase. It lasted about an hour. A third attack took place in his office that July, lasting one and a half hours. The fourth, and last, had occurred two nights before his visit to the writer, while he was visiting a friend and sitting down. It lasted three hours.

The attacks are preceded by a creeping sensation in the left upper arm, passing slowly down to the hand, which becomes numb. In about fifteen minutes unconsciousness supervenes. The face is said to be flushed, but he is uncertain whether there are convulsions, though others have told him that there are. The duration of the attacks was only surmised.

*Previous History.*—Scarlet fever at six, without bad sequelæ. An active-living, healthy man, except for two years of asthma twenty-five years before, a result of constant attacks of catarrh. It was cured by working as a farm hand for three weeks. He smokes two cigars and a pipe a day. He took coffee, and was a heavy drinker, until after the attack; now he has ceased to take even tea. He has always been abstemious in eating, but has been fond of salty foods. He drank "when he felt like it." Since these attacks he has had a pain over the forehead when coryza occurred. As he had read that insanity might come on from this catarrh, he was at first a little anxious about his state, but soon steeled himself against it. The pain in the head was rather a feeling of depression and a grumbling pain, like that of catarrh. The discharge was slight, and the headache disappeared when it ceased. He used to sleep quite well, but about the time of his attacks began waking in the early morning, and could not fall asleep again. This persisted. He had been recommended to eat more and to take fat meat, and this he has done.

*Physical Examination.*—*Reflexes.*—Knee kick, R.>L. Triceps, L.>R. Radials equal; none markedly exaggerated. Plantar reflex is flexor. The left cremaster is absent.

*Sensibility.*—No abnormality in lower limbs to pain, touch, temperature or attitudes, though the latter are sometimes wrongly named, but correctly recognized. Arms, perfect localization of light touches, both segmentally and axially. Spacing sense of fingers normal. Other modalities normal, except sense of attitudes poor, especially in the left hand. No hemiopia or color inversion of visual fields.

*Motility.*—Normal, but left fingers weaker than right. Diadocokinesis regular. Pupils contract promptly.

*Psychic Functions.*—He thinks his memory is weakened since the attacks. There are no disorders of speech. Emotionally, he has always been easily excited when there was a cause, and has been accustomed to occasional sadness.

*Diagnosis.*—The localization of the aura in the left arm and hand, along with the increase of the triceps reflex and the loss of the cremasteric, point to an organic perturbation of the sensori motor area of right hemisphere, probably mainly in or near the cortex of the central fissure, opposite the frontal convolution. The cremaster governing fibres are, of course, attacked in some other situations.

As neoplasm and granuloma were each unlikely, and as the man's age is that of arteriosclerosis, of the state preceding which the recently acquired matutinal insomnia was indicative, the writer believed it wise, although lack-

ing proof, to adopt the supposition of sclerogenetic toxicosis, and put it to the experimental proof of therapeutics. Accordingly, a diet light in proteins was ordered, and coffee and tobacco were forbidden. The result was confirmatory, as the patient, one year from the consultation, remained free from attacks and insomnia, and was perfectly well able to perform his very strenuous work, often in high altitudes.

The writer believes that the first attack was inaugurated in consequence of an ischemia of a part of the right Rolandic region, due to the heart, strained by the high altitude, not being able to keep full of blood a partially sclerosed vessel distributed to that area. The second attack was likewise due to a sudden demand upon the heart upon leaving the train after a very hot journey.

Thus although a sclerosed area still remained, the fits ceased when the metabolism was rectified.

This is true not only of epileptic convulsions, but of many varieties of cerebral malfunction, such as vertigo, depressions, etc., concerning which the writer has already written.\*

The above objections to the cerebral seat of epilepsy become pregnant in conjunction with the fact that in a perfectly healthy cerebrum, even in animals, a toxin—absinthe—will invariably produce an epileptic convulsion.

Objection may be brought to the exogenous character of the absinthe poison as an illustration.

But in puerperal eclampsia, we find a state where an endogenous toxin causes convulsive attacks quite like those found in epilepsy, and that these occur in spite of an undamaged cerebrum no one denies. So that we have in them examples of convulsion purely functional, that is to say, occurring apart from structural changes in the cerebrum. Although in view of the possibilities suggested by alcoholic wet brain and uremia, where the mechanical effect of edema may play a part in the genesis of the convulsions, we cannot demonstrably postulate toxicosis as the direct cause of eclampsia, yet at least a remediable toxicity is the ultimate source of the convulsions, as there is no proof of edema as the proximate source.

#### THE THEORY AS TO PATHOGENESIS AND THEREFORE TREATMENT OF EPILEPTIC CONVULSIONS.

There is much evidence that the substances at work in uremic eclamptic fits are katabolized proteins, because of the presence of these in abnormally large amount in the blood and urine of such patients. Should we not expect then that a similar failure of nitrogen metabolism may be the ultimate cause of idiopathic epilepsy?

If so, shall we not improve the condition of these patients by minimizing the metabolic work to be done by them?

\*Detection and Treatment of Neurological Phenomena Preceding Arteriosclerosis. (*Amer. Prac.*, February, 1914; *Month. Cyclo.*, 1911, etc.)

Now the standard diet of Vogt allows over 100 grm. protein, and most diet customs approximate to this too. But Chittenden has shown that 50 grm. is sufficient to maintain both body weight and muscular and mental efficiency, at least over many months. Shall we not find that patients who have convulsions when eating by custom or the Vogt standard cease to have them when their metabolic protein load is diminished to the Chittenden standard?

The writer's cases may help to answer this question. Complete metabolic study would have been desirable, but with private patients and no laboratory collaboration, the writer has not found it possible hitherto, so this contribution is purely clinical except in Case I where some study of the renal efficiency supports the preceding argument strongly.

Of course, mere amount of intake is only one factor of health in metabolism. The integrity of the organs of digestion, of internal secretion and of excretion is important; and of course the supply of oxygen to the tissues must not be forgotten. Hence, exercise and general hygiene must not be neglected even when a model diet is being followed.

Let the writer leave without development these physiological considerations and pass to clinical paradigms.

*Cases of Epilepsy in Young Adults.*—These consists of adolescents in whom one or at least a few convulsive attacks, truly epileptic, appeared to be brought on by metabolic disturbance, the treatment of which at once led to the disappearance of the attacks. In one instance cessation of metabolic cautions led to relapse which was quickly terminated by the reassumption of care.

*CASE I.—Scarlatinal Nephritis Followed by Epilepsy; Cessation of Attacks Under Treatment.*—A girl, *æt.* fourteen, was referred in January, 1914, by Drs. Spencer and Garnett because of epileptic attacks occurring at the age of ten and eleven and a half, and again three times during the winter of 1913.

She loses consciousness for less than a minute, bites her tongue, loses the urine, sleeps heavily for an hour afterwards and has headache and is dizzy for some time after. The day preceding the attack the breath is exceedingly foul, and for some days there is a pustular eruption on the face; during last summer this had been present on the feet. No psychic disturbances were noticed before the attack; but she had been of irritable disposition until seeing a play, "The Dawn of Tomorrow," illustrating a girl's bravery under misfortune. This stimulated her to better behaviour. She was a blue baby; and when five years old had scarlet fever (followed by a weak back). At eleven, albumin was found abundant in the urine on several occasions. It is now reported to be very slight in amount. She had been dieted as follows:—Breakfast: Fruit, cereal, a pint of milk, one egg, brown bread. Lunch: Oysters, brown bread, milk, custard or gelatine. Dinner: Fish, potatoes, milk, custard or gelatine. She takes 1½ quarts of milk a day and cocoa now and then. She drinks very little additional fluid and takes no salt. She is never constipated and has not menstruated, although the breasts have developed.



*Examination.*—The tongue is clean; there is no visible anemia, or caries of teeth; nutrition is good, but the muscles are inelastic. Reflexes are normal. The heart is irregular, with exaggerated pulmonic second sound; and slight hypertrophy of ventricles. She becomes livid when cold. Urine contains no albumin or casts; there is a strong indican reaction. Estimation of the renal function by phenolsulphonephthalein showed 33 per cent. the first hour and 5 per cent. the second hour; this is distinctly below normal (Dr. Fowler by Geraghty's method). Dr. Frankland by his own method reported that the excretion began in five minutes and ended in three and a half hours which he thought normal. Blood contained over six million red cells and an excess of hemoglobin. The stools were scybalous.

*Treatment.*—The special diet which the writer recommends in accordance with the principles described in this article was prescribed, and continuance of school and play were urged.

In a week, another attack occurred, and she became constipated, as the purgatives which she had occasionally taken were forbidden. Figs, however, easily remedied this.

March 8th she was again seen. Reflexes were feeble but she was in good spirits. The phthalein test (Fowler) showed 35 per cent. the first hour, none in the second hour.

She was seen again April 9th, continuing well. On May 23rd, Dr. Frankland reported somewhat slow elimination, some of the phthalein showing at the fifth hour.

However, there have been no other attacks in spite of the fact that a week before this the breath became very foul and the child heavy, which the mother thought strongly suspicious. The diet was immediately restricted, for three meals, to fruit with milk and one slice of graham bread alone, and two grains of calomel were given. Seen in September, the patient was thinner, brisker, happier and better in every way, no more attacks having occurred. In March, 1915, this patient remains well, cheerful and active, playing basket ball at school without detriment.

This case, the writer interprets as metabolic disturbance due to lowered renal function, probably from scarlatinal nephritis. Although the renal function does not improve, yet the special standard diet reduces to a minimum the toxicity of which the kidney must dispose; and hence accumulation is prevented; so that the fits no longer occur, in spite of the greatly lowered renal efficiency.

*CASE II.—Epilepsy from Over-Eating, also Hysteria.*—A clergyman's son, *et* sixteen, was referred to the writer by Dr. Claytor, January 22nd, 1911. He had been a healthy boy until January 9th, when while singing after lunch, he fell unconscious in convulsions preceded by deviation of the jaw to the left. There was no escape of urine, but he thinks he bit the tongue.

There had been no convulsions in childhood, but transient strabismus had developed at four after chicken-pox.

While he was at boarding school, aged nine, nightmares had developed after the alarm caused by a negro gun-outrage. They were supposed to be due to sleeping on the back, and his father cured him by persuading him not to do so. The family history was negative. After the first attack, a systolic bruit was heard at the cardiac apex, which was to the left of the nipple. The urine was clear and without albumin.

*The Attack.*—A dazzled feeling preceded a drawing of the mouth downwards and deviation of the jaw and a sense of falling; then consciousness was

lost, he thinks for five minutes. He awoke tired and stupid, and was frightened for over a minute. This was the only fit.

He was sent to the writer because of his alarm at a conversation at lunch about a palsied doctor's twisted tongue. This caused him to flush and have a sensation as of another attack, which caused him to leave the table saying "that jaw reminded me of my fit; I wish I knew what was the matter with me." His whole attitude was one of great apprehension about his condition.

*Examination* showed diminution of deep reflexes and absence of the plantar reflexes, with, however, a prompt response of the tensor fasciæ latæ. The other cutaneous reflexes were prompt. Sensibility was normal, and motility was unimpaired, except by the inferiority of the right diadokokinesis in a right-handed person. The visual fields were not inverted or contracted; but the veins of the optic papillæ were perhaps rather wide.

He has grown 10 in. in two years; and he gained 10 lb. in one month during the holidays, having eaten enormously of the dainties of the season. He had taken no exercise, and although he had slept much, he had kept late hours and taken a good deal of beer and tobacco.

The *diagnosis* was a functional epilepsy from disordered metabolism due to over-eating, smoking, and drinking with want of exercise, in a rapidly growing boy.

*Treatment and Progress.*—He was prescribed moderation in eating and athletics, no tobacco or alcohol, and a loose collar and shirt. He was also reassured against his alarm. The inefficacy of the last advice was shown when he returned to school; for when the boys said 'he looked bad' it affected him so that he wept and felt wretched for a long time. Furthermore, he had "a prickly feeling in the head and felt thoroughly useless about 11 a. m." This he attributed to the poor ventilation in the schoolroom; and he felt very heavy upon waking in the mornings. He was reassured, and secured permission for fifteen minutes recess out of doors every morning; and he left the track team for the gymnasium, the training for which prevented him eating between meals or smoking.

The diminution of the reflexes had ceased by February 16th, and the improvement of his hysterical attitude was shown by the fact that the paralysis of a master, although it made him fear an attack, caused no blushing. He has enjoyed good health since then. The writer has learnt indirectly of one further attack.

**CASE III.**—*Epilepsy of Three Years' Duration Cured by Careful Metabolic Regulation.*—Man, *æt.* twenty-four, was referred by Dr. Thomas Martin, September, 1911, on account of convulsions, the first of which occurred at 3 p. m., in April, 1908, after he had been up all night. He returned to college, and six weeks later had a slight convulsion lasting for a minute after lunch. Knowing the attacks to be epileptic, he became very wretched, though otherwise in good health. While in the diplomatic service, he was under the care of a consultant in London, and later went to Carlsbad, taking bromides all the time. Thence in 1909 he went to South America and ceased the bromides. In October, 1910, an attack occurred in his sleep after he had been to a race meeting for two days and had taken a good deal of alcohol; he felt dazed in the morning. This alarmed him and he resumed the careful regime he had formerly followed; but in February, 1911, he began to walk in his sleep, and one day jumped over the banister.

He consulted Dr. Pearce Bailey in New York. But on July 4th, he had an attack in the night after jumping horses at the show; August 19th, an attack at home after returning from the seashore; September 7th, after a day on train and motor; September 23rd, on arriving in Washington.

The attacks are like nightmares, they are without premonition; but one day he was dizzy several times before an attack. He does not bite his tongue or micturate; but before losing consciousness he tries to rise from his pillow. He foams at the mouth, turns his head to the right and makes a grunting noise, but only the first attack had been witnessed by others.

After the attacks there is dullness followed by restlessness for a day or so. He may be irritable for days preceding and following the attacks. While in England, he had dizzy spells, especially after eating while reading or writing, when he would lose or fail to recall the sense of a word.

A year after leaving his London physician, he had taken wine at meals or "whatever was going"; but he had ceased wine since October, 1910. His appetite is hearty and he eats fast. He is sometimes constipated. He was circumcised when ten days old. Nocturnal incontinence had occurred occasionally until nine, though he was trained before two. There were no convulsions in infancy. He was not a nervous child, and had always been of calm temperament and easy to manage. His birth was not difficult; but he has a very long head which is not a family characteristic.

There is a history of sudden drop of pulse-rate to forty and of urine of high specific gravity, but all Dr. Martin found was hyperacid urine with specific gravity 1017, a trace of indican, and an excess of HCl in the stomach.

The writer's examination showed normal deep knee reflexes, but an absent plantar reflex except in the outer toes, which, however, extend at the distal joints, when Chaddock's mode of stimulation is employed, while they flex at the metatarsal joint. Other cutaneous reflexes are also diminished; but the pupil reactions are prompt and well maintained; and the sensibility and motility were unimpaired.

He was prescribed the model diet, and advised to take moderate and regular exercise, and a good prognosis was given, because his attacks were so evidently the consequence of metabolic disturbances due on some occasions to over-exhaustion and on others to the stagnation of the circulation due to the too sedentary position for a great many hours. He returned in December, 1911, and had had no further attacks, in consequence of which there was much relief of the great anxiety which had made him miserable. The importance of perseverance in his treatment was urged upon him, as he was told that each relapse would be more difficult to control.

The writer hears that he has had no further attacks and is active and happy March, 1915.

CASE IV.—*Metabolic Migraine Resembling Petit Mal*.—A bacteriologist, æt. thirty, was referred to the writer in the spring of 1912, by Dr. Paul Johnston, because of attacks he called 'bilious,' (but not preceded or accompanied by constipation) which produce headache preceded by numbness and pricking in the fingers, followed by dizziness, mental confusion and foolish talk of parapsychic type, without loss of consciousness. These attacks have occurred every two or three months since the age of twenty-two; they are of very short duration; there were no scotomata, but they were formerly accompanied by vomiting. The headache is of the splitting kind, lasts all day and is followed by dullness and slowness of thought the day following. The capacity to concentrate his thoughts is increasingly impaired even between the attacks. He is at times irritable. He has no bad habits; and apart from these attacks he is well and strong. He received a blow on the left side of the head as a boy, and there is still a dent in the left parietal region, upon which side the headache more often occurs. He has a large appetite which he says he controls, but he eats meat thrice a day, although he says sparingly. The blood-pressure is not raised, the reflexes and sensibility are normal.



*Treatment and Progress.*—He was given the low protein 'standard' diet.\* He wrote the writer the following winter, "Since I have reduced the amount of protein in my diet and increased the quantity of vegetables, I have had no recurrence of those spells." Dr. Johnston informs the writer that he remains well to date, two years later.

#### EXPLANATION OF EFFECTS OF EMOTION.

The theory advanced is not inconsistent with the tendency, well known to psychiatrists, of emotion to precipitate convulsive attacks of truly epileptic nature in disposed individuals quite apart from hysteria.

The explanation is the interference of emotional reaction of an intense kind with nutrition. Physiological experiment has shown how rapidly the flow of salivary, gastric and intestinal juice is suppressed in dogs by fear. Clinical observation is familiar with the production by emotion of the dry mouth, the stagnant stomach, profound constipation, the clay-colored stool on the one hand, and on the other hand, the vomiting, the lenteric diarrhea and the bilious stool. Camon's experiment demonstrating the outpouring of adrenal secretion during fright, and Crile's induction of hyperthyroidism are now classical; and everyone is familiar with the cardiac excitation, respiratory disturbance, the sinking sensation of vasomotor paresis and asthenia, the forced urination produced by terror. The effects upon nutrition of such reactions as these must be great; and indeed, observation has already noted glycosuria among the effects of fear. So that it is inevitable that disturbances of protein metabolism must occur, which in some individuals are sufficient to fire the magazine required to produce a critical convulsion.

Thus, in emotion, we are dealing not with a vague cause which cannot be analyzed, but with a definite reaction possible to express in terms strictly material. This shows emotion to be merely an accessory rather than an essential or primitive cause of epilepsy.

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\*This diet is detailed in the writer's article cited; and also in an article in the *Critic and Guide*, December, 1914, and in the *West Virginia Medical Journal*, April, 1915.

## ARTIFICIAL PNEUMOTHORAX. REPORT ON RESULTS IN SEVENTY-FIVE CASES.

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During the past twelve to eighteen months much has been written on the subject of artificial pneumothorax. While the remarkable benefits and results following the use of this measure have been emphasized by many observers, the writer is still convinced that the profession in general is giving too scant attention to this form of therapy. As a result of this indifference, much useful work is being left undone. In offering this paper, with the evidence and data contained therein, the writer wishes to stimulate more interest in the most valuable aid recently offered to us in the treatment of pulmonary tuberculosis.

The writer will not go into the history of artificial pneumothorax as a therapeutic measure, but will say in passing that the profession, at least in the United States, owes a great debt of gratitude to Murphy, of Chicago, for the conception of an idea which has proved to be of inestimable value.

With the following brief description and cases cited, the writer wishes to emphasize the fact that artificial pneumothorax is a positive palliative procedure, and from present indications will prove to be curative beyond question. The object of artificial pneumothorax is to put the diseased lung as far as possible at rest, thus applying a simple principle which has proved to be of such value in the treatment of all forms of tuberculosis, especially surgical tuberculosis. By collapsing the diseased lung, we avail ourselves of several sound surgical principles, *i. e.*, immobilization, lymph-stasis, evacuation of pus cavities, approximation of the walls of same, non-interference with blood-supply if too great pressure is not used, thus allowing Nature to carry on the process of cicatrization unhampered.

## INDICATIONS OF CONTRAINDICATIONS.

Severe one-sided disease, the opposite side being free or almost free, adhesions on diseased side being absent or slight, or one-sided cases without adhesions with protracted bleeding, offer the ideal cases, according to the present use of this method. Jessen, as quoted by Garré and Quincke, claims that one

is justified in using this method in one-sided cases with involvement up to one-third of the upper lobe of the opposite lung. In early inflammatory or infiltrated process in the opposite lung there is great danger of hastening the disease. If, however, the trouble in the opposite lung is an old one, having weathered the storm, the outlook is more favorable. Extensive, strong, pleural adhesions on the diseased side, severe disease of the opposite lung, whether tubercular or otherwise, or tendency to breaking down on the opposite side, are contraindications for the use of artificial pneumothorax.

The almost immediate drop in temperature to normal, cessation of night sweats, diminution in cough and expectoration, increase in appetite and subsequently in weight and strength, give sufficient clinical evidence of the value of this procedure. In 10 cases of hemorrhage, which it has been the writer's good fortune to treat with this measure, never has it failed to stop bleeding immediately, with no return of hemorrhage.

With careful asepsis and the constant use of a manometer, the operation is simple and the danger slight indeed. With thorough local anesthesia the element of shock is practically eliminated.

The method used may be thoracotomy, as advocated by Brauer, or the simple thoracentesis recommended by Forlanini. In the writer's experience, thoracotomy has offered no special advantage and has been found more trying on the patient. He is of the opinion that if a pleural cavity exists it can be demonstrated as easily by thoracentesis as by thoracotomy, and, furthermore, thoracotomy, being a 'cutting operation,' is more alarming to the patient, and not so without some foundation. A 1 per cent. novocain in a 1 to 10,000 adrenalin solution makes a safe and satisfactory local anesthetic. The succeeding layers from skin to pleura may be anesthetized thoroughly with a sufficient quantity of this solution with perfect assurance. In selecting a point for puncture, it has been the writer's experience that physical signs and the *x*-ray offer no help. The interspaces in the midaxillary line seem to offer the best points of entrance, but this is not invariably true, and the writer is thoroughly convinced that one is justified in making attempts in other areas, whether at apex or base, after failing in the region of the midaxillary line. After selecting a point for puncture, the needle connected with the manometer is the only means of demonstrating the existence of a pleural cavity. If such does exist, the mercury will be drawn up and oscillate with inspiration and expiration. The manometer having indicated negative pressure with fluctuations, of at least 1 cm. mercury, the operator is safe in allowing the gas to flow. The amount of gas injected varies with the individual. In 10 hemorrhage cases the writer has used 1,000 c.cm., 850 c.cm., 1,100 c.cm., 900 c.cm., 1,000 c.cm., 1,000



c.cm., 1,000 c.cm., 800 c.cm., 800 c.cm., and 1,000 c.cm., respectively, for the first injections. While there was no great discomfort or untoward symptoms from these large amounts, the writer thinks it wiser, in the average non-emergency case, to start with 400 to 500 c.cm., using larger amounts in successive injections, as signs indicate. He is of the opinion that 1 cm. mercury of positive pressure is a safe average within the pleural cavity.

After collapse, whether partial or complete, the *x-ray* is invaluable in following the extent of the same accurately. Percussion and auscultation again fail us here on account of the various shapes the collapsed lung may assume. With the help of the *x-ray* one can also determine accurately any heart displacement, pleural effusion, and watch the amount of compression on the mediastinal space.

The discomfort following artificial pneumothorax is usually greatest following the first and second injections. Pain is generally complained of either in the shoulder or under the last rib and seldom at the point of needle insertion. Shortness of breath often follows the first two injections, but is seldom of more than twenty-four hours' duration. Rest in bed during the first month of treatment is undoubtedly valuable, as in the writer's cases those kept in bed for the first month have made better progress than those allowed to be up and about. The following dangers from artificial pneumothorax are practically all avoidable if care and judgment are exercised:—

1. *Pleural effusion* in early cases may be the result of imperfect asepsis or insufficient local anesthesia. This seems to be a natural sequence in old-standing cases. It is hardly of any consequence, usually disappearing without aspiration.

2. *Heart displacement, aortic kink and interference with circulation* may result from too great a pressure.

3. *Pressure on Mediastinum.*—This can be avoided if one is careful not to make more than 1 or 2 cm. positive pressure in the pleural cavity.

4. *Gas Embolism.*—This is avoidable if one gets negative pressure and 1 cm. oscillation before starting the flow of gas.

5. *Emphysema.*—This is especially apt to follow thoracotomy and is an objection to it. With thoracentesis it is avoidable if one will roll the flesh around the needle track between fingers after extraction of needle. The smaller needles also minimize this possibility. The writer has seen at autopsy one case of natural pneumothorax undoubtedly caused by too great pressure on a superficial gaseous area.

6. *Natural Pneumothorax.*—This condition may follow the induction of artificial pneumothorax, and the writer is sure it is a more common complication in pulmonary tuberculosis than has

been heretofore supposed. In these cases in which this has occurred under his observation, all have progressed favorably.

If pain and dyspnea occur, the operation should be stopped temporarily and the pressure tested. If pressure is not positive, it may be resumed without any great further inconvenience if the gas is injected slowly—25 to 75 c.cm. at a time—with a few minutes between injections. Severe pain or dyspnea, the writer thinks, is sufficient indication to cease the flow of gas for that sitting.

The writer's experience with this form of therapy has been entirely with advanced cases. In his opinion, it would be a perfectly sane procedure in early cases in which the disease continues to advance in spite of the usual hygienic and sanatorium treatment.

It may be of interest here to quote from the *Muenchner Medizinische Wochenschrift* of September 6th, 1913, the results obtained by the use of this method in pulmonary tuberculosis accompanied with laryngeal tuberculosis. Zink, of Davos, Regnier, of Leysin, and Schroeder all report remarkable results in their throat cases. Regnier claims 78 per cent. complete cures, and 8 per cent. practically cured, some thickening remaining. Schroeder claims 58 per cent. and Zink 30 per cent. cures of all their cases.

Zink states, however, that in extreme non-localized perichondroid lesions involving interlaryngeal opening or progressive epiglottic tuberculosis, with severe dysphagia and widespread ulcerative processes, the disease has advanced beyond the point where artificial pneumothorax can be of any benefit. The writer's experience thus far with artificial pneumothorax would warrant the following conclusions:—

1. This form of treatment is founded on safe and sane principles and has won a distinct place in the treatment of pulmonary tuberculosis.

2. It is positively palliative, with the clinical evidence in favor of it as a curative measure.

3. With due care it is practically without danger.

4. It is especially valuable in the treatment of pulmonary hemorrhage.

5. From the writer's experience, together with that of others, in the treatment of advanced tuberculosis with artificial pneumothorax, there is no reason to believe that the same procedure is not applicable to early advancing cases.

6. The possibility of its value in laryngeal tuberculosis accompanying pulmonary tuberculosis is worthy of consideration.

The writer will not attempt to report a large number of cases in detail, but will limit himself to a few striking examples.

CASE I.—Male, *aet.* twenty-two; sick two years. Right lung involved throughout. Cavity formation. Left apex slightly involved. Occasional

blood-spitting. Abundant cough and expectoration. Average daily range of temperature, 97 to 100 and 101° F. Extremely emaciated, no appetite, poor digestion. Right lung collapsed. No rise in temperature after forty-eight hours following first injection. Patient, six months after first injection, up and doing light work. Within 4 lb. of average normal weight. Expectoration decreased nine-tenths, and no further sign of bleeding. On tuberculin for past month.

CASE II.—Woman, *aet.* twenty-four, disease of five years' duration. Sent here from Eastern sanatorium to die. Left lung entirely involved. Right apex very slightly involved. Abundant expectoration. Average range of temperature, 97.3 to 100° F. Streak sputum occasionally. No appetite; poor digestion; considerable emaciation. Left lung collapsed. No rise in temperature after twenty-four hours from first injection. Cough and expectoration reduced to the merest trace. Normal weight regained. Has earned own living as stenographer for six months and remains perfectly well.

CASE III.—Woman, *aet.* twenty-three. Disease of three years' duration. In bed for over nine months. Average daily range of temperature, 97 to 102 and 103° F. Left lung entirely involved. Extensive cavity formation. Right upper lobe involved. Abundant expectoration. Extensive emaciation. Left lung collapsed. Average daily range of temperature now 98 to 99.3° F. Gained 12 lb. in weight. Appetite excellent. Patient up and out for the past two months. On tuberculin for the past two months.

CASE IV.—Woman, *aet.* thirty, sick three years. In bed most of the time during last seven months. Left lung entirely involved and two large cavities. Right apex infiltrated. Abundant cough and expectoration, extreme weakness, emaciation. Left lung collapsed. Drop in temperature gradual, reaching normal in about one week. Temperature normal for past four months. Has gained 28 lb. Up and about, feeling perfectly well.

CASE V.—Male, *aet.* twenty-nine. Disease of seventeen months' duration. Right upper lobe involved. Left lung clear. On June 17th had good-sized hemorrhage. Between June 17th and June 30th had eleven hemorrhages of various sizes. On June 30th, after good-sized hemorrhage, consented to pneumothorax as a last resort. Right lung collapsed. One thousand c.cm. of gas injected. Bleeding ceased immediately with no return to date. Pulse and temperature normal. Patient gaining weight and able to be up and out after three weeks from date of first injection.



## CESAREAN SECTION FOR PRIMIPAROUS BREECH PRESENTATION.

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By JOHN T. WILLIAMS, M. D., of Boston,  
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The fetal mortality in primiparous breech presentations is variously stated as 10 per cent. by Williams,<sup>1</sup> Moran,<sup>2</sup> and Berkeley and Bonney<sup>3</sup>; as 13 per cent. by DeNormandie<sup>4</sup>; as 20 per cent. by Edgar<sup>5</sup> and Jardine<sup>6</sup>; and as 30 per cent. by Hirst.<sup>7</sup> In spite of this high fetal mortality, none of these authors suggests cesarean section as a possible or desirable method of delivery except De-Normandie, who recommends it in contracted pelvis. It has, of course, been impossible to review the entire literature of cesarean section, which is colossal; but a fairly thorough review of the larger publications devoted to obstetrics and of the newer textbooks of obstetrics has failed to reveal any reference to this subject, although Good<sup>8</sup> mentions 2 cases in which he performed cesarean section for this indication.

It may be admitted without question that the same degree of pelvic contraction which would indicate cesarean section in vertex presentation should indicate the same operation in breech presentation. We no longer, however, rely solely on pelvic measurements to determine the need for cesarean section. In vertex presentation the determination of the relation of the fetal head to the pelvic brim is of much greater importance than the size of the pelvis alone. Unfortunately in breech presentation there is no way of comparing directly the size of the fetal head with the size of the pelvis; therefore, some other method must be sought for.

To understand the proper management of breech presentation one must go back and search for the cause. The classic experiment of Schatz<sup>9</sup> has shown that a fetus suspended in liquor amnii will sink by the buttocks rather than the head, so that the normal predominance of head presentations can be explained only by a process of accommodation of size and shape of the fetus to the size and shape of the uterine cavity, for if presentation were decided by the centre of gravity, breeches rather than vertices would predominate.

It is usually stated that breech presentation is more frequent in multiparæ than in primiparæ. Williams gives the proportion as 59 to 41, but DeNormandie found 57.2 per cent. in primiparæ at the Boston Lying-In Hospital. In multiparæ, without doubt, a re-

laxed abdominal wall and a flabby uterus explain a majority of the breech presentations. In primiparæ, however, these conditions practically never occur, since the uterus and abdominal wall, stretching for the first time, are always under considerable tension.

Breech presentation in the primipara must be ascribed to one of two specific causes—

1. A disproportion between the fetal head and the pelvic brim.
2. A disproportion between the fetus and the shape or size of the uterus.

Disproportions between the fetal head and the pelvic brim may be grouped into two classes—

A. Those in which the fetal head exceeds in size the corresponding diameters of the pelvis.

- (a) Contracted pelvis.
- (b) Unusually large baby.
- (c) Hydrocephalus.

B. Those in which the size of the pelvis is relatively too large for the fetal head.

- (a) Justo-major pelvis.
- (b) Small baby in normal pelvis.
- (c) Premature baby.
- (d) Twins.

Disproportions between the fetus and uterine cavity may again be subdivided into—

A. Anomalies of the fetus.

- (a) Twins.
- (b) Ascites.
- (c) Fetal tumors.
- (d) Congenital cystic kidney.

B. Changes in the shape and size of the uterus.

- (a) Uterine tumors.
- (b) Placenta previa.
- (c) Hydramnios.

It is the belief of the writer that a breech presentation always results from some definite cause, which should be sought for, although it may not always be discovered.

When it seems certain that the disproportion is that of a pelvis relatively larger than the fetal head, or the presentation is due to such anomalies of the fetus as twins, ascites, fetal tumors or hydramnios, the old expectant management of breech presentations may be carried out, the patient being allowed to go into labor, and interference resorted to only as some indication arises.

When it seems probable that the diameters of the fetal head are relatively greater than those of the pelvis, either because of a contracted pelvis or an unusually large baby, or where there is a tumor

of the lower uterine segment, cesarean section should be performed before the onset of labor.

Were it possible to diagnose hydrocephalus with certainty before delivery, the most rational procedure would be intrapelvic delivery by perforation of the aftercoming head. Practically, however, many of these cases will be delivered by cesarean section, the diagnosis being made only after birth.

There will still remain, in spite of the most careful examination, a large number of cases in which no definite disproportion between the fetus and pelvis can be demonstrated before delivery.\* The writer believes that a probable fetal mortality of from 10 to 30 per cent., together with the danger of severe injury to the maternal soft parts justifies the elective cesarean section in these cases as covered during the operation.

The two personal cases in which the writer has performed cesarean section for primiparous breech presentation illustrate some of the points he has tried to bring out.

CASE I.—Mrs. E. L. H. Primigravida; aged twenty-seven. External measurements: E. C. 20 cm.; I. S. 25 cm.; I. C. 30 cm. Conjugata vera 11 cm. Presenting part cannot be reached by vaginal examination. Palpation reveals head at fundus uteri, small parts above pubis. Estimated weight of child  $7\frac{1}{2}$  to 8 lb. Cesarean section advised, indication high primiparous breech, and accepted.

Operation July 15th, 1914. Cesarean section. Uterine muscle found studded with small fibroids. A submucous fibroid the size of an orange was found projecting into the lower uterine segment, too high to be felt by vaginal examination, and which had prevented engagement of the fetal head. Furthermore, the condition of the uterine muscle showed the improbability of the patient accomplishing anything by uterine contractions had she been allowed to go into labor. Hysterectomy was refused by the patient's husband, so the operation was completed as a conservative cesarean section. The baby, a female, weighed  $7\frac{1}{2}$  lb. Both mother and baby did well. The writer believes that without cesarean section this child would undoubtedly have been lost, and delivery by the natural passages could have been accomplished only by the most severe trauma to the maternal soft parts.

CASE II.—Mrs. R. H. P. Seen with Dr. R. W. McAllester, of Everett, December 2nd, 1914. I. gravida, due December 7th, 1914. External measurements, E. C. 19 cm.; I. S. 21 cm.; I. C. 26 cm. Conjugata vera 10 cm. Fetus presenting by breech, well above brim. Estimated weight of fetus  $8\frac{1}{2}$  to 9 lb. Cesarean section advised, indication primiparous breech, slightly contracted pelvis, large baby. Operation December 5th, 1914, cesarean section. The baby, a female, weighed  $9\frac{1}{2}$  lb., and did well. The mother's convalescence was somewhat prolonged by a low-grade uterine sepsis, but eventually she also made a good recovery. Extraction of a  $9\frac{1}{2}$  lb. baby through this patient's pelvis would undoubtedly have resulted in the loss of the baby, and deep tears and much shock to the mother. The sepsis which complicated her convalescence

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\*The writer has purposely omitted from consideration the cases of breech presentation complicating placenta previa, because the presentation is of secondary importance to the pathological location of the placenta.



was in no way a result of the method of delivery, since if the infection had been put in at the time of operation, the patient would have had peritonitis rather than intrauterine sepsis.

#### CONCLUSION.

The point which the writer has tried to make in this paper is that the existence of a breech presentation in a primipara always means some disproportion between the fetus and pelvis, or the fetus and uterine cavity. Unless it can be definitely established that the disproportion is due to absolute or relative small size of the fetus, cesarean section before the advent of labor should be the method of choice for delivery.

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- <sup>6</sup> Jardine: *Clinical Obstetrics*, 1910, p. 356.
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- <sup>8</sup> Good (*Boston Med. and Surg. Journ.*, 1913, Vol. CLXIX, p. 345).
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## UTERINE CARCINOMA AND ITS PROMPT DIAGNOSIS.

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By B. R. WHITCHER, M. D., of West Somerville, Mass.

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If ever there is a disease which requires a prompt and early diagnosis in order that it may be nipped in the bud, and the patient saved from an insidious and loathsome disease and suffering towards the last from agonizing and excruciating pain, it is uterine carcinoma. Therefore, as the following case will show, a great deal of trouble can be avoided, in the case of a woman who is approaching, or has passed the menopause, coming to the physician and complaining of an irregular, sanious discharge, more or less bloody, or chiefly serous, with pains in the back, especially in the lumbar region, either intermittent or constant, by the physician insisting upon a careful and thorough physical examination, in order that the disease may be recognized early, and, if carcinoma be present, operative treatment be resorted to, as soon as possible, to arrest the disease promptly at the start and save the patient untold agony and suffering later on.

Therefore, a general practitioner needs to be well posted on the symptoms and various signs of uterine carcinoma, especially in its earliest stages, in order that he may readily recognize the disease. Any woman between thirty-five and sixty years of age, who comes to the physician complaining of increased menstruation, of metrorrhagia, of pelvic pain or of vaginal discharge, especially if she has passed the menopause and menstruation has ceased for some time, should be most careful and thoroughly examined at once, on suspicion that carcinoma may be present. In fact, it would be advisable, in case of any woman under thirty-five coming to the physician complaining of the above symptoms, to insist upon a thorough examination, for, while of rare occurrence, malignant growths have been found in women between puberty and the menopause.

On October 30th, 1908, the writer was called to see Mrs. S. at her home. The patient was fifty-three years of age, and gave the following family history. Father died of fatty heart and mother of tuberculosis. One brother living and well, and another brother died of measles at the age of six years.

Her past history was as follows. Measles when a child, and canker rash. First menses at thirteen, always regular and painless. Married at eighteen. Had two children, a boy and a girl, one dying at ten months, and the other of scarlet fever at nine years of age. Menopause began at forty-four and menses finally ceased at forty-eight.

The patient had complained of pain in her lower limbs and numbness in both feet. Very nervous; slept poorly; bowels constipated. Arches of both feet markedly flattened. Patient showed appearance of being poorly nourished and had a somewhat cachetic appearance, which gave the suspicion from her general appearance, that uterine carcinoma might be present, but she did not wish to be examined, so it was decided best to postpone the examination. For her nervous condition and also as a general tonic, she was given *Blaud* and strychnine pills to be taken one after each meal, and five grains of salacetin to be taken before retiring. Also for her bowels she was given a mixture containing aloes, rhubarb and senna.

Patient called at the writer's office on November 5th and felt a little better. Bowels more regular. Feet considerably relieved by felt pads. On November 18th and December 8th she called again and seemed to be generally improving. Her complexion seemed to take on a little healthier appearance and her appetite had improved and bowels become more regular. She was able to sleep better once she was able to compose herself to sleep, but found it difficult to do so. During the meantime she had been kept on *Blaud* and strychnine pills.

She called again on January 6th, and this time she had begun to complain of dull pain in the sacro-iliac region, especially on lying in bed, and she also complained of an occasional uterine discharge, appearing at irregular intervals, resembling normal menstrual discharge, and very scanty. No pain was present with the discharge, however. This made the writer more suspicious than ever of the presence of carcinoma. He advised that she had better have an examination, but as she did not wish it, he gave her some ichthyol vaginal suppositories to use before retiring, to be followed by a mild creolin douche the next morning. Also had her continue the *Blaud* and strychnine pills.

Nothing more was heard from the patient until the night of February 24th, 1909, when the writer was called at about midnight to attend her. She had been taken with a sudden hemorrhage, and when he arrived he found it had been considerable and the odor was horribly fetid. The vagina was filled with a clot of blood as large as a man's fist. He finally got things cleaned up and gave a hot douche of creolin and alum, which stopped the bleeding, then he tamponed the vagina with an ichthyol-lamb's-wool tampon. The following morning he called and gave patient a hot creolin douche and made a most thorough examination. Uterus in an advanced carcinomatous condition. Cervix hard and nodular, os readily admitted examining finger, uterine cavity was found to be very much eroded and lining very friable. Fetid discharge. Uterus swabbed out with pure carbolic acid and alcohol, and ichthyol tampon introduced. Called again in the afternoon and found the patient rest-



ing comfortably. For the next few days, up to March 2nd, the writer called each day to see the patient, swabbing out the uterine cavity with pure carbolic acid and alcohol, after giving a hot creolin douche, then tamponing the vagina with an ichthyol tampon. On March 2nd the case was discharged, as the only treatment which the writer could give her was palliative and the only hope for her lay in a thorough operation, and even then, it is doubtful if it really would have saved her life, for the cancer was pretty well progressed, and with the uterus in such an advanced carcinomatous condition, it is very likely that the lumbosacral lymph-nodes were involved.

A day or so later the patient went to an adjoining town to live with some relatives, and a short time afterwards she was sent to a home for incurables, where she died a little later, the direct cause being a severe hemorrhage, doubtless from erosion of the uterine artery or some one of its tributaries, by the rapid growth of the carcinoma.

Such a case as this shows the importance of early recognition of uterine cancer, so that operative measures may be promptly taken to nip the disease in the bud, and save the patient a great deal of suffering.

Kelly in his "Medical Gynecology" (Chapter XXI) says, in regard to early diagnosis and prophylaxis of uterine carcinoma: "The education of the public mind on this question is peculiarly important on account of the prevailing impression that irregularities of menstruation and the existence of vaginal discharges are a feature of the normal menopause, and must be accepted as a matter of course." Many a woman after the menopause ascribes any vaginal hemorrhage to a return of menstruation. But Shoemaker\* says that "when a year or two has passed after a normally established menopause, the appearance of blood, if only a small spot, from the genitalia, often means cancer. It need not be persistent nor abundant; its very presence more than a year after the menopause is sufficient to arouse grave apprehension of malignant disease." But unfortunately a most potent cause of failure in treatment of uterine cancer, as the previously mentioned case shows, is neglect on the patient's part to apply for advice, until the disease is so far advanced that an operation offers no hope.

Therefore it is the duty of the general practitioner to warn the public of these danger signals, and if every family physician, as Kelly states in the above-mentioned work, would, in his relations with his women patients, point out the significance of hemorrhage and pelvic pain occurring at about the time of the menopause, and if the least signs of any of these symptoms appear, point out to the patient the vital importance of a thorough pelvic examination,

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\**New York Med. Journ.*, 1905, Vol. LXXXIII, p. 1092.

he would do more towards diminishing the death-rate of cancer than can be done by any other means we can command at present.

Finally as a means of prophylaxis against uterine cancer, it is advisable

(1) That, in from six to eight months after confinement, the attending physician should visit his patient and make a careful and thorough examination, so as to determine whether there has been any traumatism, and, if so, its nature and extent.

(2) Every woman who has borne children should be examined once a year by a competent physician until she is fifty-five years old, and in that way a large number of cancer cases could be diagnosed and cured in their early incipency.

A work somewhat after this fashion has of late been attempted at Kœnigsberg, Germany, by Winter, where the dangers of cancer have been pointed out by an article in a leading daily paper, giving explicit details of cancer and the importance of its early diagnosis, showing that most cancer cases are curable if only operated upon in time.

## UPON THE LOCAL TREATMENT OF MALIGNANT PUSTULE WITH MERCURY BICHLORIDE.

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By CARLO SAVINI, M. D., of New York.

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In the treatment of malignant pustule the serum of Sclavo should be used whenever available, but even when using the serum the pustule should be locally destroyed.

Many times the surgeon is not able to provide the serum and must limit the treatment to the local destruction of the pustule. So it is always most important that this local destruction should be well done.

In the writer's opinion, any method requiring any cutting (incision or excision of the pustule) is very dangerous, as new ways of infection are thus opened.

The writer's purpose is to describe a simple and thorough means of treating locally the malignant pustule, which for many years and in many cases has given him very good and satisfactory results without the use of any serum.

This method consists in directly applying coarsely powdered bichloride of mercury on the pustule without resorting to any incision or excision.

An opening a little larger than the area of the pustule (about  $\frac{1}{2}$  in. in diameter) is cut in the center of a piece of adhesive plaster 2 in. square, and then this plaster is applied to the skin of the affected part in such a way that the pustule remains uncovered in the middle of the opening of the plaster. A quantity of coarsely powdered mercury bichloride is then spread on the pustule so as to cover it entirely. The surrounding healthy skin is protected by the adhesive plaster. The bichloride must be used very abundantly. Another piece of adhesive plaster of the same size is now applied over the first to close the opening and keep the powdered bichloride in place.

After twenty-four hours the two layers of the plaster are removed, and the excess of bichloride found on the pustule is wiped away. The pustule has now changed into a dark eschar, all the surrounding edema has entirely disappeared, the general condition of the patient is improved, and it seems nothing remains of the infection but a local lesion which is not very painful. This local lesion is now dressed aseptically. Sometimes the writer has found it convenient to apply some zinc oxide ointment over it. The eschar with clear-cut edges detaches itself in about ten days and the ulcer-



ation resulting therefrom generally heals in from two to three weeks.

The writer used this method many years ago. He was then practising medicine in a small mountain village in Umbria, Italy, and had very frequently to deal with cases of malignant pustule. Almost all his patients thus treated recovered, and the few deaths to record were due to the fact that he was called so late that the patients were already in coma from general septicemia.

This method of treatment is very popular in Umbria, and the shepherds in those mountains do not wait to consult a physician, but when affected they apply this remedy themselves. By the necessities of their peculiar life, they have learned to recognize the dreaded disease also in its beginning, and in their baggage they always carry a supply of mercury bichloride in a sheep's horn, in case of need.

The writer will report here briefly 5 cases treated with this method in New York since 1903. They all recovered.

The first case was a man twenty-five years old working as a longshoreman. While carrying hides in unloading a ship, he was infected on the left side of the neck. On the third day of infection he applied for treatment at the New York Dispensary.

The pustule on his neck was large and the edema extended to his left arm, to the anterior part of the thorax, and to the left side of his face. The general conditions of the patient were bad.

The writer applied bichloride of mercury, the next day the patient was improved, and in about two weeks there was complete recovery.

Some time after treating this patient, a malignant pustule appeared in the anterior surface of the writer's right forearm, about 3 in. above the wrist-joint. One evening he began to feel a persistent and very annoying itching in the forearm and noticed a very small circular area to which he attached no importance. Next morning he found his right hand very heavy. A small bulla had taken the place of the red spot noticed the evening before, and the whole forearm was edematous. By 10 a. m. the hand was also swollen. He applied the treatment at 10:30 a. m., fourteen hours after the appearance of the first symptoms. In about three weeks he was perfectly well.

The third case was a child three years old, brought to the writer's office in 1911 with a pustule in the anterior part of the right arm near the elbow-joint. Infection dated two days. The whole arm was swollen. Perfect recovery after the application of bichloride.

The fourth case occurred in 1913, and was also a child, five years old. The pustule on the dorsal side of the right hand had been incised because mistaken for a cellulitis. Infection of two days'

duration. The whole hand was swollen. After the application of mercury bichloride, recovery was prompt.

The fifth case was a young man of twenty-five years with a pustule on the dorsal side of the right hand. This patient was also operated with multiple incisions. The incisions were very superficial and the pustule was left untouched. The swelling increased after the incisions were made and was up to the elbow-joint. The infection dated three days. The patient did not remember having handled hides. He recovered promptly after the application of bichloride.

Three supposed objections may influence the surgeon against the adoption of this treatment: First, it may seem that the pain produced by the application of pure mercury bichloride will be very great and unbearable; secondly, that the resulting scar will be very deforming; and, thirdly, that there may be danger of mercurial poisoning through the wound.

As a matter of fact none of these unfavorable results is to be feared. Judging from the experience of many cases so treated, and especially from personal experience when the writer was himself afflicted, he can state as a fact that the pain during the first twenty-four hours of the application of mercury bichloride is not very great and certainly not so annoying as the dull, itching sensation which the patient feels at the time that the pustule first appears.

The scar resulting from the treatment is not very deforming. The writer has applied this method on the faces of many patients and has never seen a deformity. On the contrary, he has always been surprised to see that after a short time the scar was hardly noticeable.

As for the absorption of mercury, the writer has never seen a case of mercury poisoning in the number of patients treated. It seems that the pure salt, acting upon the tissues, causes coagulation of the protoplasm of the cells, thus preventing absorption and poisoning.

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# MEDICAL AND SURGICAL PROGRESS.

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## RECENT ADVANCES IN THE CHEMOTHERAPY OF CANCER.

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By MOYER S. FLEISHER, M. D., of the Editorial Staff.

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1. Loeb (*Journ. Med. Research*, 1901, Vol. VI, p. 28).
2. Wassermann, Keysser and Wassermann (*Deutsch. med. Wochenschr.*, 1911, No. 51; *Berl. klin. Wochenschr.*, 1912, No. 1).
3. Neuberg, Caspari and Løhe (*Berl. klin. Wochenschr.*, 1912, No. 30).
4. Neuberg and Caspari (*Deutsch. med. Wochenschr.*, 1912, No. 8).
5. Uhlenhut, Dold and Bindseil (*Muench. med. Wochenschr.*, 1912, No. 32).
6. Apolant (VI Tag. d. fr. Verein. f. Microb., 1912).
7. Loeb, Fleisher, Leighton and Ishii (*Interstate Med. Journ.*, 1913, Vol. XX, No. 1).
8. Werner (*Zeitschr. fuer Chemother.*, Vol. II, Nos. 9 and 10).
9. Werner and Szecsi (*Zeitschr. fuer Chemother.*, 1913, Vol. I, No. 4).
10. Walker and Willingham (*Lancet*, April 12th, 1913).
11. Loeb and Fleisher (*Journ. Amer. Med. Assoc.*, 1913, Vol. LX, p. 1857).
12. Lewin (*Berl. klin. Wochenschr.*, 1913, No. 12).
13. Izar (*Zeitschr. fuer Immunitätsf.*, 1913, Vol. XV, Nos. 2 and 3).
14. Izar and Basile (*Berl. klin. Wochenschr.*, 1913, No. 28).
15. Loeb, Fleisher, Lyon, McClurg and Sweek (*Trans. Assoc. Amer. Phys.*, 1913).
16. Koenigsfeld and Prausnitz (*Deutsch. med. Wochenschr.*, 1913, No. 39).
17. Contamin, Detoeuf and Thomas (*Bull. de l'assoc. franç. pour l'étude du cancer*, 1913, Vol. VI, No. 6).
18. Blumenthal (*Berl. klin. Wochenschr.*, 1913, Nos. 42 and 43).
19. Loeb (*Lancet-Clinic*, December 27th, 1913).
20. Fleisher and Loeb (*Journ. Exper. Med.*, 1914, Vol. XX, No. 2, and 1914, Vol. XX, No. 5).
21. Fleisher, Vera and Loeb (*Journ. Exper. Med.*, 1914, Vol. XX, No. 5).
22. Leighton (*Journ. Exper. Med.*, 1914, Vol. 20, No. 5).
23. Keysser (*Zeitschr. fuer Chemother.*, 1914, Vol. II, Nos. 2 and 4).



24. Pentimalli (*Deutsch. med. Wochenschr.*, 1914, No. 40).
25. Loeb and Fleisher (*Journ. Exper. Med.*, 1915, Vol. XXI).

As was to be expected, after the report of successful treatment of cancers in mice by Wassermann and his collaborators, the work in this field has been very active and numerous interesting results have been obtained. It is to these results that we will turn our attention, considering chiefly those which have pointed in new directions, or which have carried our theoretical knowledge further in this field. We will not consider here any results obtained in the treatment of human cancer, but it will suffice to say that while with certain substances, which had been used first experimentally in animals, improvement in the condition of some of the patients has been obtained, and at times even retrogressive changes in the tumors have been noted, no definite cures have been reported by any of the investigators. The consideration of the results obtained in the animal experimentation will give us the basis of these unsuccessful results obtained in the treatment of humans. We will not consider the work which has been done with the organic arsenic preparations, chiefly salvarsan and atoxyl, since this work has largely been done in humans, and further because it gives no clue to the direction in which the future work in this line must be pursued, or to the hopes which we may be justified in placing in this work.

We shall not attempt a complete historical review of the work which has led up to the experiments of Wassermann; suffice it to say that his work is based primarily upon the results obtained in other fields of chemotherapy. It is of interest to note that one of the very earliest workers in the field of experimental cancer research, Loeb, attempted to treat transplanted rat sarcomata with intraperitoneal injections of potassium iodide in some of his earliest work in 1900. These injections did not lead to a definite growth inhibition. These experiments represent, as far as the literature on cancer research reveals, the first attempts at the experimental chemotherapeutic treatment of cancer.

Wassermann, Keysser and Wassermann, who used a combination of selenium and eosin in their work, reported very glowing accounts of the results of these injections in their first papers; they reported cures of the tumors, not giving the percentage of tumors cured, however. They encountered two difficulties in their work—the toxicity of the drug used and the necessity to use a dose but little under the lethal in order to destroy the tumor; and the instability of the drug as well as the apparent variation in the different samples made at different times. In addition, a number of animals injected with the eosin-selenium died as a result of the absorption of the necrotic material contained in the retrogressing tumors, or rather in the old tumor capsule. They believed that the action of the injected substance was a specific action on the tumor cell and most especially an action on the nuclei; the selenium was supposed to have an affinity for the nuclear substance and to act destructively on the nuclei. The eosin in the compound acted according to their idea, only as a carrying substance, which transported the selenium through the blood-vessels to the tumor.

Shortly following the publication of their results, Neuberg and Caspari published the results of their experiments in which they

had used numerous heavy metals combined with colloids in treating tumors in mice. Their results were very similar to those obtained by Wassermann and his co-workers. Combinations of tin, platinum, zinc, copper, silver and cobalt were found to be the most effective. These metals were in many cases combined with glyccoll. Neuberg had started from the theoretical basis of the proved fact that the heavy metals increased the autolytic activity of tissues, and he believed that by the injection of these preparations into the blood-stream he had brought in contact with the tumor cells substances which served to increase the autolysis which normally takes place in the centre of the larger and older transplanted tumors.

Werner, and later Werner and Szecsi, also used the heavy metals to produce an action on tumors, but they combined their metals with cholin, a decomposition product of lecithin. This they used on the basis that either  $x$ -rays or radioactive substances break lecithin down to its lower products when tissues are exposed to the action of these rays, and that it is this breaking down of the lecithin which is an important factor in the destructive action of the radioactive substances upon tumors. They used a preparation of cholin known as borcholin, which is borate of cholin. They also obtained similar effects to those reported by Wassermann and Neuberg—namely, softening of the tumors after one or several injections, and finally, in a small percentage of cases, the entire resorption of the tumor, and thus a cure.

The results of these early investigators were, of course, not accepted by all, and we find that Uhlenhut, Dold and Bindseil and also Contamin, Detoeuf and Thomas, when using a mixture of eosin and selenium, were not able to verify the results of Wassermann; but neither of these two investigations were carried out with the same preparations as those used by Wassermann, Keyser and Wassermann, as at that time the preparation of the eosin-selenium used by these latter investigators was not published. This difference might well account for the difference in the results, especially as Wassermann and his collaborators stated that they had great difficulty in obtaining a substance which would act upon the tumors, and only found it after trying many different substances.

On the other hand, Apolant, using the same preparation as did Wassermann, found similar results as did these first investigators.

Loeb, Fleisher, Leighton and Ishii also showed that the action of colloidal copper, as well as certain copper and casein combinations, inhibited the normal growth of mouse tumors, although these substances did not destroy the tumors or lead to a definite cure. Soon afterwards Loeb and Fleisher reported similar results with colloidal copper as well as with a number of other proteid substances. They considered the possibility that the first action was on the blood-vessels, although they admitted that there might be also a direct action on the tumor cells.

Izar, and Izar and Basile reported upon the effect of the intravenous injection of colloidal sulphur upon rat tumors, and they found that this colloidal substance caused softening and in some cases the complete cure of sarcoma in rats.

Lewin used various preparations of gold, such simple ones as 'goldsol' (colloidal gold) and potassium gold cyanate, and found that these substances produced the same effects upon the tumors



as did the more complex preparations of Wassermann, Neuberg or Werner. Lewin further believed that the effect of these substances upon the tumors was due, not to a specific action upon the tumor cells, but to the action of these substances upon the capillaries of the new growths.

As a result of the experiments of these last three mentioned investigations, it may be seen that the carrying substance which Wassermann considered necessary for the satisfactory action of the selenium used in his work was not essential, and that the substances were carried to the tumor and there acted upon them even if no 'rails,' as Wassermann termed the eosin in his compounds, were laid for the bringing of the active substances to the tumors.

Blumenthal, who used various arsenic preparations, also used enzymol in his work, a preparation of cholin borate, and found this to act upon tumors in animals.

Pentimalli used a large number of substances containing selenium, a number of the members of the fluorescein group of stains, various salts of heavy metals, as platinum, gold, silver, mercury, osmium, bismuth and thorium, some saponin compounds, calcium chloride, thorium X, fluorbenzol, and phenol. With none of these was he able to obtain a curative effect, and indeed apparently no effect upon the tumor whatsoever was produced. With preparations similar to those used by Wassermann, he obtained cures in from 1 to 2 per cent. of the injected animals.

Koenigsfeld and Prausnitz attacked the problem of the treatment of tumors from an entirely different point of view than that from which the previous investigators had proceeded. Believing with Russel and Da Fano and the school of Bashford that the failure of growth of transplanted tumors in immunized animals was due to the failure of the host to furnish a suitable connective-tissue structure to carry the blood-vessels to the graft, and to serve as a supporting structure upon which the cells might grow and extend; and having at hand a substance which acted upon the connective-tissue, they investigated the influence of injection of this substance into tumor mice. The substance used was thiosinamin—allylthiocarbamide—which Starkenstein had shown to act upon the connective-tissue *in vitro* (*Therap. Monatschr.*, 1910, Vol. 24, p. 68). Koenigsfeld and Prausnitz injected this substance subcutaneously into mice with tumors, and found that the growth of the tumors in injected mice was markedly slowed, and in some cases, when the thiosinamin was injected early into the tumor mice, the tumors did not grow. The action of this substance was not like that used by the other investigators, since it caused no softening or necrosis of the tumor; furthermore, it is not stated whether it destroyed the larger tumors, as it was used early after the inoculation of the tumors. The other substances were used only after the tumors had reached a considerable size—after about two or three weeks of growth. Koenigsfeld and Prausnitz then tried to determine which of the components of the compound was the active one, and they found that it was the allyl radicle which inhibited the growth of the connective-tissue. They used several other substances which contained this allyl radicle, and found that most of these substances also inhibited the growth of tumors. Their experiments are rather along a different line than those followed by most of the other investigators, but it must be borne in mind



that the effect of this treatment would appear to inhibit growth and not to destroy tumors which had already grown to large size.

Walker and Willingham, who did not believe with either Wassermann that the action of the substances was a specific one on the tumor cells, or with Neuberg that the action was due to increased autolytic action, used injections of ernusin and pituitrin in tumor mice to show that the distribution of the blood was the factor in the hemorrhages and necroses occurring in the tumors. They believed that as a result of the very high blood-pressure in the vascular system, the vessels of the tumors, which are but poorly supported and which are thin-walled and weak, have too great a pressure put upon them and as a result they rupture and first lead to the hemorrhages about the tumors and then as a result of the interference with the blood-supply a necrosis of the tumor follows.

Keysser, who has reviewed the results obtained by the earlier investigators, and especially those of Wassermann and his co-workers, Neuberg and his co-workers, and Werner, has given the figures of the actual cures obtained with the various substances; in his earlier work he was only able to obtain cures in 1 to 2 per cent. of the injected animals, later in 6 to 8 per cent., certainly not a very large proportion of the animals. He further investigated the cause for the conflicting results reported by various investigators, and found that the effect of the eosin-selenium preparation varied with the staining activity of the eosin used; thus those eosin preparations, which stained the tissues of the animal most actively after intravenous injection, were also the most active when combined with selenium. Furthermore, he found that it was not necessary to use a chemical compound of eosin and selenium, but that a simple mixture of these two substances served equally well to produce the necrosis of the tumor. He also used a copper preparation similar to that which Neuberg and Caspari had used and one similar to that used by Werner and Szecsi.

By a special technique, Keysser produced infiltrating tumors of the internal organs of mice, and when these were treated with the three substances there was no effect noted; they grew as normal and showed no softening or even congestion such as the subcutaneous tumors show after the first injection of the substances. Neither did these organ tumors hold the stain as did the subcutaneous tumors, for these latter show the stain after the organs of the body have returned to their normal color. Keysser did not think that this failure of action of these substances was due to the different distribution of blood-vessels in the organ tumors, since Goldmann had apparently shown that the blood-supply of intraperitoneal tumors or tumors growing in organs is the same as that of subcutaneous tumors. He does not offer any explanation of this difference in the action of these substances on subcutaneous and infiltrating tumors growing in organs.

In order to test the theory of Wassermann concerning the action of the selenium compound on tumors, Keysser allowed quantities of eosin-selenium to act upon small pieces of tumor *in vitro* for some time, and found that on transplantation of these pieces into mice they grew as normal; therefore, it does not appear that the selenium is a specific nuclear poison for tumor cells as Wassermann had thought it to be.

In order to test the theory of Neuberg and to find whether the

autolysis actually destroyed the life of the tumor cells, Keysser aspirated the softened substance from the centre of the treated tumors and injected this material into mice; in some of these mice tumors grew; from which it appears that the so-called autolysis does not destroy the tumor cells. There may be several objections raised to this method of testing the condition of the softened material in the centre of the tumors, chief of which is the fact that it is quite possible that some living cells from the periphery of the tumor (the portion which was not as yet softened) may have been picked up by the aspirating needle and transferred to the inoculated mice. On the other hand, there is not any reason why we should not find some, indeed a large number, of living cells in this softened material.

Keysser also tested the effect of injections on tumors shortly after their inoculation, and found that the growth of these tumors was not interfered with by the injections. This fact had been announced previously by Loeb and Fleisher, who used colloidal copper and hirudin (leech extract). Keysser further found that tumors treated in this manner, that is, injected soon after inoculation, when they were injected at later stages when the injections usually caused softening of the tumors and in some cases cures, were not affected by the treatments, and only occasionally did a small area of softening appear, which confirmed the facts previously published by Loeb and Fleisher. The growth of these tumors was not inhibited by these latter injections. It therefore appears that with none of these three substances can a real cure be obtained; and, furthermore, that if the action of these substances is that of causing autolysis of the tumor, that it only increases the rapidity of the already begun autolysis, for in the older tumors at that stage when the substances are effective, there is already, in the central portion of the tumor, necrosis and some autolysis. Keysser therefore believes that we must search elsewhere than through autolysis in order to find a chemical substance which will cure cancers.

In order to explain the failure of the action of these substances on the infiltrating organ tumors, Keysser brings forward the fact that the handling of the tumors, when they are palpated to determine the effect of the injections, may cause the hemorrhages, and these in their turn may so interfere with the nutrition of the tumors as to cause the softening. He cites an experiment in which those tumors, which were not palpated during the time of injection, showed no hemorrhage or softening. Whereas this factor may probably be of considerable importance in determining the occurrence of hemorrhage and softening, it is not likely that the handling alone is the prime causative factor. Keysser's experiment seems to have been carried out on a small number of mice, and it is well known that in some cases these substances fail to affect certain tumors.

Loeb and his co-workers have, during their work, extending over a period of several years beginning in 1912, used a large series of substances, some heavy metals, some proteins, carbohydrates, lipoids, and some inorganic substances. They found that colloidal preparations of copper and gold and platinum had not a curative effect, but did markedly inhibit the growth of the tumors; they used a quantitative measure of the growth of the tumors, at least



in certain cases, by weighing the tumors, and thus were able to demonstrate minor degrees of the effects of the injections upon the tumors. On the other hand, colloidal preparations of selenium and sulphur did not affect the tumors. None of the inorganic salts of the various metals seemed to affect the growth of the tumors; potassium gold cyanate was the only exception, and this affected the tumor but slightly.

Among a large number of organic colloids used, the only ones which affected the growth of the tumors were casein, nucleoprotein and hirudin. The latter substance had the most marked action on the tumors and led to a cure in a small percentage of cases. It would appear from these results obtained with organic substances without any addition of heavy metals, that the tumors can be affected by materials other than those which cause increased autolysis *in vitro*, as do the heavy metals, and therefore that the effect of these substances is not due to an increasing of the autolytic activity of the tumors.

These investigators further found that when the injections were continued for some time, the effect apparently did not continue, but the tumors began to grow normally or much more rapidly than they had grown during the earlier period of the injections. From the beginning of the investigations, Loeb had considered the possibility, that as a result of the injections immunity is produced, and these observations seemed to confirm these views. Further investigation of the development of immunity against these substances, which inhibited tumor growth, was therefore undertaken.

The failure of the action of some of the substances, which other investigators had found to be efficient in inhibiting tumor growth, may have been due, in Loeb and Fleisher's experiments, to the fact that these substances do not act upon all tumors in the same manner, although Keysser had found in his experiments that the substances used by him acted upon two kinds of carcinomata and one sarcoma in an equal degree. Also the fact that copper when in pure colloidal state or when combined with some colloid material does act upon tumors, but when in the form of inorganic salts does not have any effect, shows that the state of the substances used influences their activity upon the tumors.

Reverting to the question of immunity to these growth-inhibiting substances, we find that Loeb, Fleisher and others have conducted an extensive series of experiments to determine the nature of this immunity. They used in their experiments in this field colloidal copper and hirudin, and controlled, by quantitative weighing methods, the results obtained by palpation.

They found that when mice with tumors were treated with colloidal copper or hirudin for a short period, from the second day after inoculation onward the tumors in these mice were but little affected by injections of either of these substances when given at the time when normal—unimmunized—tumors were inhibited in their growth. This immunity was only apparent when the early injection and the later one were of the same substance; thus when both first and second injections were of colloidal copper. This immunity was therefore specific, colloidal copper immunizing against colloidal copper and hirudin against hirudin.

Furthermore, when tumors which had been treated with either of these substances were inoculated into mice, and these mice were



then injected with these substances (using, of course, the same substance as had been used in the preceding generation), the growth of the tumors was little if at all inhibited. The cells of the tumors had therefore developed an immunity against the substances.

It was, however, also found that when mice were injected with either of these substances before the tumors were inoculated, and that when these mice were injected with the same substance again after the tumors had grown to the size suitable to note the effect of the inhibition, an immunity to the effect of these substances had been developed. It appears thus that the immunity to the action of these substances is due to the development of resistance reactions, not only in the host in which the tumor is growing, but also in the cells of the tumor itself, and that this latter immunity may be inherited by succeeding generations of tumor cells.

In view of the importance of these results in outlining the future work in chemotherapy, Loeb and Fleisher carried out a second series of experiments to confirm these results regarding the development and nature of the immunity, and were able to confirm their earlier work and make more definite the specificity of the immunity developed against the substances. They further investigated the effect of combining two substances which were in themselves quite active—namely, colloidal copper and hirudin, and found that when these two substances were injected into animals in combination, their action was distinctly more marked than when injected separately. Tentatively, Loeb suggested that the action of these substances upon the tumor is not specific upon the tumor cell, certainly not primarily so; but that the action is rather due to an alteration in the capillary walls of the tumors, which increases the permeability of the vessels and permits of transudation with resulting edema, and even hemorrhage in some cases. Possibly, secondarily, these substances may exert some action on the tumor cells. These later results led Loeb and Fleisher to the assertion that there is also present a direct action on the tumor cells.

In order to determine whether these substances, which they had found to be active in inhibiting the growth of tumors in mice, were also active in inhibiting the growth of experimentally produced temporary new-growths, Loeb and Fleisher also tested the action of certain of these substances on experimentally produced deciduomata. They found that the growth of these deciduomata was not affected by most of the substances used, among others, colloidal copper, but that they were affected by hirudin, hemorrhages taking place in the growing tissue with resulting destruction of the deciduoma. At the same time the follicles of the ovary, with the exception of the very small ones, showed degenerative processes as a result of these injections. It would appear that the hirudin tends to produce hemorrhages in the body at such places where the blood-vessels are less resistant.

In this connection, it is interesting to note that after one injection of hirudin, casein or nucleoprotein, and within twenty-four hours after the injection, the tumors in mice, so injected, showed softening and edema, while on the other hand, when colloidal copper and some other substances, which were also equally active in inhibiting the growth of tumors, were injected, this softening did not appear, the edema being the only effect on the tumor visible.

Leighton tested the effect of the colloidal copper, casein, nucleoprotein and hirudin upon regenerating tissue, the regenerating epithelium about a skin wound, but could find no retarding effect from these substances.

In the further study of the action of these substances, Loeb and Fleisher found that the intravenous injection into guinea-pigs produced necrosis of the liver, so that they warned against the possible injurious effect of these substances. Since, however, it was only rarely that such necroses were noted in the livers of mice, this reaction may be a specific one in guinea-pigs.

Although the results of the investigations in the experimental chemotherapy of cancer have so far not revealed effects on tumor growth sufficiently strong to encourage the use of any of the substances tried in the treatment of cancer in humans, they have led us to certain conclusions which must guide us in future work.

It seems probable that the theory that we may hope to destroy cancer cells by stimulating their autolytic activity must be given up; and that further work starting from this theoretical basis will not carry us toward a successful solution.

Furthermore, we must seek for some substance which will be able to destroy all or almost all the tumor substance at the first injection, or otherwise we will be thwarted by the development of immunity; or it will be necessary to have at hand two or more substances, so that when immunity to one has been produced, the others can then be used, for the immunity to the substances is apparently specific.

## DIVERTICULA OF THE BLADDER.

## A REVIEW OF RECENT LITERATURE.

By JOHN R. CAULK, M. D., of the Editorial Staff.

1. Bryan: Diverticula of the Bladder With Report of a Case. (*Amer. Jour. Urol.*, February, 1913, Vol. 9, pp. 72-82.)
2. Bagozzi: Congenital Diverticula of the Bladder. (*Osp. Maggiore*, Milan, 1914, 2 s., 11, p. 369.)
3. Brongersma: Treatment of Congenital Diverticula of the Bladder. (*Zeitschr. fuer. Urol. Chir.*, 1914, Bd. 2, p. 388.)
4. Cabot: Report of Ten Cases of Diverticulum of the Bladder. (*Trans. Amer. Assoc. Genito-Urin. Surg.*, 1914.)
5. Ghezzi: True Lateral Diverticulum of the Bladder With a Report of the Case. (*Bull. d. Soc. Med. Cli. Parma*, 1913, 2 s., Vol. 6, pp. 130-137.)
6. Gordon: Notes on Two Post-Mortem Specimens of Diverticula of Urinary Bladder. (*South African Med. Record*, 1914, Vol. 12, p. 125.)
7. Leriche: The Surgical Treatment of the Diverticula of the Urinary Bladder. (*Annals Surg.*, February, 1912, Vol. 55, p. 285.)
8. Lower: An Improved Method of Removing Diverticula From the Bladder. (*Cleveland Med. Jour.*, 1914, Vol. 13, pp. 1-7.)
9. Marion: Resection of Diverticula of the Bladder. (*Jour. d'urol.*, 1913, Vol. 4, p. 785.)
10. Pasteau and Belot: A Case of Vesicular Diverticulum With Calculus. (*Bull. et mém. Soc. de Radiol. méd. de Paris*, 1914, Vol. 6, p. 77.)
11. Scalone: Diverticula of the Bladder. (*Clin. Med., Milano*, 1913, Vol. 21, p. 2314.)
12. Squier: Surgery of the Hour-Glass Bladder. (*New York Med. Jour.*, 1914, Vol. 99, p. 1076.)

There are several features concerning vesical diverticula which are creating enough discussion to make an abstract on this subject seemingly worth while.

The points of importance and dispute about these pouches are their origin, their effects and their treatment. It is not agreed among the medical fraternity as to whether these pouches are congenital or acquired. Some believe that they are all congenital, others, diametrically opposed, believe that they are all acquired; some believe they may be either. Those who consider them of congenital nature, and at present the adherents are numerous, use as their main argument the fact that these diverticula contain all the coats of the bladder, and that they occur in young people without evidence of obstruction, and that they are frequently associated



with other congenital abnormalities. Cabot, in his report of 10 cases in 1914, showed that the average onset symptom was at thirty-seven years of age, that only two of them showed clinical evidence of obstruction; and he says that the advocates of the other theory must prove that the cause of the obstruction occurred in early life and had disappeared, leaving no trace, and this he would consider miraculous. In the discussion of his paper before the American Association of Genito-Urinary Surgeons, most of the men believed strongly in the congenital nature of these pouches. Those who contended that they are acquired, showed the great frequency with which they occur beyond middle life in the age of obstruction and the frequency with which they occur in prostatic obstruction; also the great preponderance in the male sex where obstructions are more common, and the fact that some do not contain muscle fibres in their wall, but are mere hernias of the mucous membrane extruding through the bladder musculature. Their occurrence, however, in perfectly clean unobstructed bladders, at times associated with other congenital anomalies, makes one confident of their congenital nature. The fact that they are so frequently associated with obstruction is because they are made manifest by the obstruction and are found during the course of examination for such obstructions.

These pouches may pass unnoticed for years, producing no symptoms whatever, and often only show themselves when complicated by cystitis or associated with urinary obstruction. Their chief danger lies in their pressure effects upon the ureter, as they are most commonly located about the ureteral orifices and in their growth may insidiously obstruct the ureters causing hydro- or pyonephrosis.

They are occasionally the seat of bladder tumors. Young and Buerger have reported the findings of tumors in these pouches. The case of Young was a diverticulum connected with the bladder by a very small opening and containing a large carcinoma which was removed by excision. Buerger reports a papilloma in a diverticulum which was treated by fulguration. In his case there was marked contractility of the orifice. These pouches also frequently contain calculi.

The diagnosis is usually easy and is made definite by means of the cystoscope. Large diverticula may be palpable and outlined. An important diagnostic point which can frequently be elicited by the passage of the catheter, is the removal of two types of urine in two acts, that is, a catheter is passed, a fair amount of hazy urine removed, a cessation occurs, and another emptying takes place of foul cloudy urine, due to the emptying of the diverticulum into the bladder. Guthrie mentions another point to the effect that on injecting the bladder with water one cannot withdraw immediately as much as one has inserted. The more recent scientific method of determining the nature and extent of these pouches is by means of the cystoscope and the *x-ray*. With the cystoscope one can determine the size and location of the orifice and can frequently cystoscope the diverticulum in order to determine its content, or an *x-ray* catheter may be passed in the orifice and curled up and an *x-ray* picture taken to show its apparent size. The writer on one occasion was compelled to use this method when the filling of the sac with collargol failed to demonstrate the sac. In this

case the orifice was small and situated well up on the bladder. Filling the bladder and the diverticulum with a silver solution and taking an *x-ray* picture is the usual and most satisfactory way of determining the size of these pouches. A catheter is passed, the bladder is filled to full distention, and an *x-ray* picture immediately taken. This will almost always show the comparative size of the diverticulum to the bladder. In case the diverticulum is posterior to the bladder and the sac is overshadowed by the bladder, the patient may be tilted to the side and an *x-ray* picture taken.

Knowing that diverticula are present, what shall be our line of therapy?

Herewith is a brief summary of the measures employed for their relief. Some physicians believe that when they are provoking no trouble they need no treatment, and in those who are too old and feeble to stand operation, palliative treatment by catheterization and irrigation is recommended. Surgically, they may be attacked in the following manner: By incision of the orifice or dilatation of the orifice, making a larger communication between the bladder and the pouch. Pousson recommends for cases which cannot be freed and enucleated, the sterilization of the cavity with strong iodine followed by alcohol or by 20 per cent. nitrate of silver, curetting the mucosa of the sac, denuding the margin of the orifice and closing it off from the bladder. Bladder is then closed with catheter drainage through the urethra. Another method which was done by Squier in case of a large, very adherent diverticulum, which he was unable to separate from the rectum, was to clamp off the bladder and the diverticulum from each other with intestinal forceps, dividing the septum between the two and closing each with a puckering stitch, closing the bladder and isolating the diverticulum. His patient made a good recovery.

The method of election in all cases of diverticula is excision, and they should be excised even if they are causing no symptoms, because of their proximity to the ureter, because they will sooner or later exert a deleterious influence on the kidney, and it is wise and conservative to remove them early, before any such complications ensue. The principle of the operation is to separate the diverticulum from the bladder and from the surrounding structures and to remove it entirely. This is easy in uncomplicated and non-adherent diverticula. These can occasionally be removed intravesically by invagination and amputation of the sac, but the usual diverticulum at the time of operation is quite adherent and very difficult in its removal. There are certain little tricks employed by different operators which will obviate some of the difficulties, the two most important of these, the principle of which is the same, are the rubber balloon of Leriche and the gauze packing described by Lower. This is done in order to transform a cystic cavity into a solid tumor and is the most important factor in the easy removal of a bladder diverticulum. The manner of operation in the resection of the sac differs when done by different surgeons. Marion opens the bladder suprapubically, separates the peritoneum from the surrounding tissues. He then cuts the bladder laterally down to the neck of the diverticulum, not opening the peritoneum, unless unavoidable, inserts his finger in the diverticulum, dissecting it from the surrounding tissues on his finger, being careful to avoid the ureter. After the sac is freed, it is amputated by careful

incision around its neck. Bladder is closed laterally and suprapubically, with drainage suprapubically.

Lower opens the bladder suprapubically, packs the diverticulum with gauze until it is firm. He then, without incising the bladder wall down to the sac, cuts the sac away from the bladder, then works on his gauze packing, separating the diverticulum from the surrounding structures. This method seems to simplify in a great measure the radical removal of bladder diverticulum.

In case the ureter opens into the diverticulum, the method of Young, which involves leaving a flap of the bladder wall around the orifice and using this flap to help in the transplanting, is the most satisfactory technique in such cases. As the ureter is so intimately associated with these diverticula, it is of extreme importance to identify it early in the operation. Many surgeons preliminarily catheterize the ureters and leave the catheters in place during the operation. Cabot isolates the ureter in the neighborhood of the iliac vessels, clamps it with a Crile clamp to prevent wound contamination by the urine, opens it and passes a good-sized bougie into the bladder. In case the ureter cannot be dealt with by the technique of Young, it must be divided and transplanted into the bladder. Cabot also believes in instituting drainage to the ureters, when they have been dilated by these diverticula, particularly if ureteral transplantation has been done. The results of resection of diverticula have been excellent, and though the operation is usually a difficult one on account of adhesions, shock has not played an important part, and the mortality has been gratifyingly low.



THE TREATMENT OF SERPENT ULCER OF THE CORNEA  
WITH ETHYLHYDROCUPREIN HYDROCHLORIDE.

## A REVIEW OF RECENT LITERATURE.

By JOHN GREEN, JR., M. D., of the Editorial Staff.

1. Ginsburg and Kaufmann (*Klin. Monatsbl. fuer Augenheilk.*, June, 1913).
2. Goldschmidt (*Klin. Monatsbl. fuer Augenheilk.*, October and November, 1913).
3. Goldschmidt (*Muench. med. Wochenschr.*, July 7th, 1914).
4. Gradle (*Muench. med. Wochenschr.*, 1914, p. 276).
5. Kuemmell (*Muench. med. Wochenschr.*, 1914, p. 1326).
6. Kuhnt (*Centralbl. fuer g. Ophth.*, 1914, p. 77).
7. Kraupa (*Klin. Monatsbl. fuer Augenheilk.*, 1914, p. 177).
8. Leber (*Trans. Thirty-ninth Meeting of the Heidelberg Ophth. Soc.*, 1913, p. 148).
9. Morgenroth (*Wien. med. Wochenschr.*, March 14th, 1914).
10. Morgenroth (*Berl. klin. Wochenschr.*, November 23rd-30th, 1914).
11. Morgenroth and Levy (*Berl. klin. Wochenschr.*, Nos. 34 and 35, 1911).
12. Peterka (*Muench. med. Wochenschr.*, 1914, p. 1228).
13. Schur (*Klin. Monatsbl. fuer Augenheilk.*, October and November, 1913).
14. Schwartzkopff (*Klin. Monatsbl. fuer Augenheilk.*, 1914, p. 236).
15. Wiener (*Med. Record*, January 17th, 1914).

Serpent ulcer of the cornea has always been a *bête noire* to oculists. This serious affection, beginning insidiously and often for a time running an indolent course, usually develops into a virulent infection spreading superficially and deep, and resulting, if unchecked, in perforation of the cornea. It is usually caused by the pneumococcus.

Solutions, powders, salves, etc., without number have, from time to time, been advocated as efficacious in controlling the infection. Many a drug, highly extolled as a result of its successful application in a few cases, has, in the long run, proved to be of little or no value. In desperate cases the principal reliance has been upon cauterization, either by heat or acids, or the well-known Saemisch incision. Even when these radical measures were adopted, the end result was, not infrequently, an adherent leukoma.

The first suggestion that there might be developed a specific chemotherapy for this affection was made by Morgenroth and Levy (1911) who showed that alkaloids of cinchona, more especially ethylhydrocuprein hydrochloride, were able to kill pneumococci in the test-tube and in the living mouse. It was but a step from this

suggestion to the application of the drug in pneumococcus ulcer of the eye. This work was undertaken by Ginsburg and Kaufmann, who studied the effect of this drug on experimentally produced pneumococcal keratitis in rabbits. They injected into both corneas diluted blood of mice, dead from pneumococcus sepsis. When the infiltration became purulent, which occurred after twenty-four hours, one eye was treated with 2 per cent. ethylhydrocuprein by instillation into the conjunctival sac and subconjunctivally. The other eye was not treated. Almost invariably the treated eye was saved while the control was lost.

Goldschmidt found that ethylhydrocuprein acted as a specific in pneumococcus infections of the eye, especially in serpent ulcer. He concluded (1) that ethylhydrocuprein is that form of cinchona which gives the best clinical results; (2) that it has a direct and specific action on the pneumococcus; (3) that tolerance can be prevented by prompt and energetic treatment; (4) that repeated treatments positively eradicate the organism; (5) that in a serum vehicle a 1-800,000 dilution produces inhibition, a 1-400,000 death of the pneumococcus *in vitro*. He found that an aqueous solution up to 5 per cent. caused no injury to the tissues in rabbits' eyes and that it produced an anesthesia of variable duration. In 31 cases of pneumococcal corneal infection he instilled a 1 per cent. aqueous solution hourly and found that all beginning cases responded promptly and that even in more advanced cases the results were good. The first instillation was painful but soon a prolonged anesthesia developed which rendered subsequent applications painless. Schur applies a 2 per cent. solution on cotton, trying to limit the action of the drug to the affected area. A freshly made solution is applied until a grayish opacity appears in the vicinity of the ulcer. In his experience the rapid appearance of the grayish opacity is an indication that the ulcer is about to heal. He is convinced that the subsequent scar is much thinner than when caustics are used.

Wiener reports a case of pneumococcus corneal ulcer complicated with dacryocystitis which responded promptly to hourly instillation of a 1 per cent. solution (10 drops at each instillation). He characterizes the response to the action of the drug as 'astounding,' and states that, at the end of the third day, there was but little sign of ulcer. Goldschmidt, in another communication, declares that treatment must be given in the morning so that the cornea shall be well anesthetized before night. He uses a freshly prepared 1 per cent. ointment combined with 2 per cent. atropine. As soon as the infiltration begins to clear he substitutes a 5 per cent. noviform ointment. It is interesting to note that an accompanying dacryocystitis does not appear to be especially detrimental in cases of *ulcus serpens* which are treated with ethylhydrocuprein. Apparently the pneumococci in the lacrymal sac are killed by the entrance of the ethylhydrocuprein solution into the sac. The drug has also been found to be efficacious in pneumococcal catarrhal conjunctivitis.

Leber uses a 1 per cent. aqueous solution dropped into the sac or applied to the ulcer with a cotton swab. In 75 per cent. of his cases the ulcer promptly healed; in most of the remaining cases the healing, while slow, has been satisfactory. A few cases, held in check for a time, developed further infiltrations which failed to

yield to the remedy, a failure ascribed to the development of a tolerance to the drug.

Schur states that in all cases treated one should determine positively that the pneumococcus is the causative factor, and advises that a Gram-stained smear from the progressive edge of the ulcer be examined to prove the specificity of the infection. He uses a cotton pledget dipped in a 2 per cent. solution applied with slight pressure to the ulcer for a period of two minutes. Besides a 1 per cent. solution is instilled into the sac every hour or so until the ulcer is perfectly clean. Energetic treatment from the beginning is insisted upon. Both Schur and Morgenroth insist upon the value of this treatment in the hands of the general practitioner who sees these cases first. They believe that in the future neglected cases of this trouble will become much rarer when the first physician who sees the case can use ethylhydrocuprein as an emergency treatment. In a very few cases there appears to be an inherent resistance of the pneumococcus to ethylhydrocuprein. As ethylhydrocuprein is an absolute specific for the pneumococcus, we must think of another organism or of a mixed infection if it fails to cure.

Gradle reports favorable results with ethylhydrocuprein in pneumococcus chronic dacryocystitis, although on anatomical grounds one would hardly expect good results. Kraupa lays stress on the value of ethylhydrocuprein as a prophylactic before operations, since pneumococci are the most direct cause of infections after operation. At the Leipzig clinic, every pneumococcus bearing patient is treated before operation with 1 per cent. ethylhydrocuprein ointment. After twenty-four hours no more organisms can be found in the conjunctival sac. Kuhnt believes that in this method we have scored a great advance inasmuch as, in the absence of lacrymal disease, the general practitioner may now successfully treat a case of serpent ulcer.

Kuemmell is especially impressed with the insignificant opacities. Schwarzkopff reports 27 cases from the Berlin University Eye Clinic. The Goldschmidt ointment was used for three days, but omitted thereafter because of a caustic effect on the parenchyma of the cornea. The anesthetic action of ethylhydrocuprein has been utilized by Peterka to control the blepharospasm in eczematous conjunctivitis of children.



## DIAGNOSTIC AND THERAPEUTIC NOTES.

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PRELIMINARY STAGES OF DIABETES.—Bergell (*Deutsch. med. Wochenschr.*, 1914, No. 51). It has long been known that, in doing Trommer's test for sugar, we find that the alkalized urines of diabetics dissolve much more copper sulphate than those of normal individuals. This phenomenon, the writer believes, may be used diagnostically. The urine to be tested is diluted to a specific gravity of 1012. To 20 c.cm. of the urine add 7 c.cm. of 15 per cent. NaOH, and shake once. Then add 3 c.cm.  $\text{CuSO}_4$  solution and shake well. Filter. The urine of normal individuals will barely be colored. That of diabetics and of certain other groups of individuals will show a deep blue color.

If a mild case of diabetes be put on a carbohydrate-free diet, the sugar will first disappear from the urine, the color test remaining positive. After a few days the latter will also disappear.

If normal individuals, with negative color test, be given 30 grm. dextrose in solution, the color test will become positive, although no sugar appears in the urine.

The color test is rarely positive in normal individuals except among the descendants of diabetics. Of such adult descendants, 60 per cent. show a positive reaction, while the juvenile descendants give a positive test in 80 per cent. of the cases studied. In all of them, the test could be rendered negative by means of a carbohydrate-free diet.

These observations lead the writer to infer that a positive reaction in the absence of glycosuria indicates a pre-glycosuric stage of diabetes. Patients with a positive color reaction should be treated like mild cases of diabetes and the test should be kept negative in their urines by means of a restricted carbohydrate intake. In this manner, it may be possible to prevent, or at least to defer, the development of a true diabetes.

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PARASYPHILIS AND SALVARSAN.—Schwarz (*Deutsch. Zeitschr. fuer Nervenheilk.*, Vol. 52, Nos. 3 and 4). Paresis is not curable by means of salvarsan, though prolonged remissions follow its use more frequently than with any other treatment. Tabes, however, is curable. Large doses, repeated at proper intervals, lead not only to subjective improvement but to disappearance of all abnormalities from the spinal fluid. Every syphilitic should have his spinal fluid tested and should be treated until the latter becomes normal.

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SUCCESSFUL TREATMENT OF HAY FEVER.—Emmerich and Loew (*Muench. med. Wochenschr.*, 1915, No. 2). Five cases of hay fever, that received the calcium chloride treatment during 1913 and remained free from symptoms, had the same experience during the

summer of 1914. The calcium chloride treatment (previously described in these columns) is entirely harmless, since the calcium chloride is promptly converted into calcium phosphate in the stomach and intestine. Moreover the amount of lime administered daily does not exceed that contained in a pint of milk. The advantage of giving the calcium in the form of the chloride consists in the fact that the calcium phosphate derived from it is finely distributed or even dissolved in colloid form.

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**SIMPLIFIED WIDAL'S TEST.**—Liebermann and Acél (*Deutsch. med. Wochenschr.*, 1914, No. 50). In the test, as usually done, the blood is either allowed to clot and the serum used, or the blood, diluted with physiologic salt solution, is centrifugated to free it from the red corpuscles. Neither of these procedures is necessary. If the blood be made to flow into distilled water, complete hemolysis sets in at once and the clear, though colored, fluid may be used for the test. A convenient preliminary dilution is to allow two drops of blood from the finger-tip to flow into 1 c.cm. of distilled water. This corresponds to a dilution of serum in the proportion of 1:20, and may be further diluted with physiological salt solution as desired.

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**EARLY DIAGNOSIS OF INCIPIENT PULMONARY TUBERCULOSIS.**—Lawhorn (*Arch. Diagnosis*, 1915, No. 1). The presence of fine râles, whether at apices or elsewhere, in persons suspected of having pulmonary tuberculosis, affords the earliest positive sign of the disease. To bring out these râles, the author advocates Beifeld's method, recently described in these columns. He has, however, modified the method somewhat. The patient is instructed to count repeatedly in whispers, "one, two, three," six or more times, in the same outgoing breath and then to cough also in the same breath, taking care not to inspire at all before the cough, then to inspire deeply, immediately after the cough. The patient will always spontaneously take a deep inspiration after the cough.

If the fine râles sought for are constantly present and not dissipated on coughing followed by deep inspirations or are elicited regularly after the continued whispering, coughing and inspiration combined, the conclusion of a positive diagnosis is justified.

The diagnostic factor is that if the fine moist râles are transitory or disappear by this or any of the auscultatory methods, the condition is not of a tuberculous nature. This is exemplified in a bronchitis, where upon the first examination more or less suspicious râles are discovered, but upon deep inspirations or coughing they disappear temporarily or permanently, while in pulmonary tuberculosis the opposite is true.

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**A NEW SERUM TEST FOR SYPHILIS.**—Gordon (*New York Med. Jour.*, 1915, No. 8). One-half c.cm. of blood serum is placed in a test-tube. Five drops of a one per cent. solution of bichloride of mercury are slowly allowed to fall in the center of the tube. The following phenomenon is observed. If the serum comes from a normal individual or from an individual suffering from other diseases but free from syphilis (as proved by a Wassermann test),

the moment the reagent comes in contact with the serum a cloudiness will appear which will rapidly increase in density so that at the end of five and sometimes ten minutes the entire or almost entire amount of the serum will present a thick gray mass with a slightly greenish tint. In some cases the thickness appears at once, in other cases shortly after the dropping of the reagent, and in still other cases five or ten minutes later. In syphilitic serums the contact of the reagent produces not the foregoing thick mass, but only a foamy upper layer which remains as such for some time. Here one observes a distinct slight upper whitish and foamy layer beneath which the normal serum is evident; the latter preserves the same appearance and color as prior to the manipulation.

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TREATMENT OF DIABETES.—Allen (*Boston Med. and Surg. Jour.*, 1915, No. 7). Fasting is advocated as the basic feature of a successful treatment of diabetes. The patient is put to bed and allowed no food except alcohol. The sugar soon disappears from the urine and the acetonuria diminishes. When the fasting patient has been free from glycosuria for twenty-four to forty-eight hours, the next step is to begin feeding very slowly and cautiously. There need not be a fixed program. It is desirable to individualize the diet to suit the needs of different patients, and various physicians may have personal preferences of their own. The one requirement is that the patient must remain free from both glycosuria and acidosis. Any trace of sugar is the signal for a fast day, with or without alcohol. The original fast, to clear up the urine in the first place, may be anything from two to ten days, but after that no fast need be longer than one day. The things to be considered in the diet are carbohydrate, protein, fat, and bulk. Frequently the first thing given after the fast is carbohydrate. No distinction is necessary between different forms of starch, but there are advantages in using vegetables, following Joslin's convenient classification on the basis of carbohydrate content. The first day after fasting, the only food may be 200 grm. of vegetables of the 5 and 6 per cent. classes. This is increased day by day until a trace of glycosuria appears, which is checked by a fast day. The purpose of such a program is to learn the carbohydrate tolerance and to clear up the last traces of acidosis. After this carbohydrate period, or sometimes in place of it, protein is given. On the first day perhaps one or two eggs are given, and nothing else. More protein, generally as eggs and meat, is added day by day, until the patient either shows glycosuria or reaches a safe protein ration. The purpose here is to learn the protein tolerance, and to cover protein loss as quickly as possible. Fat is somewhat less urgently needed, except in very weak and emaciated patients, and it can be added gradually, as conditions seem to indicate. An element of bulk in the diet is necessary to give the comfortable feeling of fullness, and to prevent constipation. This is the great advantage of green vegetables.



## BOOK REVIEWS.

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A TEXTBOOK OF THE DISEASES OF THE NOSE AND THROAT. By Jonathan Wright, M. D., Director of the Department of the Laboratories, New York Post-Graduate Medical School and Hospital, and Harmon Smith, M. D., Surgeon to Throat Department of the Manhattan Eye, Ear, Nose and Throat Hospital, Clinical Professor of Laryngology and Rhinology, Cornell University Medical School. Illustrated with 313 Engravings and 14 Plates. Philadelphia: Lea and Febiger. 1914. Price, \$5.00.

One who is familiar with the many contributions to rhinology and laryngology from the pen of Jonathan Wright would be led to expect exactly the type of book which he has produced in collaboration with Harmon Smith. Owing to the recent appearance of the second edition of Wright's work on the history of laryngology and rhinology, the present work contains but brief reference to the various stages in the progress of the two specialities. Evidently his contribution is the anatomy, together with the histology, normal and pathological; while we are indebted to Smith for the clinical side of the volume.

Certainly, no one in this country and but few in any country are so well qualified as Wright to give an authoritative opinion in regard to the pathological histology of the various tissues and organs discussed. With him this study has for years amounted almost to a passion which has been an incentive to greater and greater knowledge. "The exceptional feature in this textbook is the emphasis laid upon the etiology and pathology of disease. No logical and scientific discussion of disease can be carried on from any other basis."

But while emphasizing the etiology and pathology, ample space is given to the clinical side as well. In this connection we would call special attention to the very excellent chapter on the differential diagnosis of syphilis, tuberculosis, scleroma and cancer. There are other chapters of equal value and clearness.

Like Browning's poetry, such a work will hardly appeal to the many, but rather to the appreciative few. As a book of reference for the well-prepared, studious specialist it is of immense value. To the specialist of the 'six weeks' variety it will hardly appeal, and with the limited time given to the various specialities in the modern medical curriculum it will hardly satisfy the needs of the average medical student. It should be in the library of every laryngologist and rhinologist.

No review of the work would be complete without calling special attention to the illustrations, which are both profuse and illuminating. Of unusual value are the many microscopical drawings and microphotographs.

It is with some temerity that one questions the statement of so eminent a medical historian as Wright. It is our opinion, however, that credit for priority in the suggestion and elaboration of the endonasal approach to the hypophysis cerebri should be given to Hirsch, of Vienna, rather than to Cushing.

DISEASES OF THE SKIN. By James H. Sequeira, M. D. Lond., F. R. C. P. Lond., F. R. C. S. Eng., Physician to the Skin Department and Lecturer on Dermatology at the London Hospital, etc. etc. Second Edition. With 48 Plates in Colour and 238 Text Figures. Philadelphia: P. Blakiston's Son and Company. 1915. Price, \$8.00.

It is rather refreshing to open a book on skin diseases and see some originality in its construction. This, the second edition, is far superior to the first. Its construction is the same, but many chapters have been revised and additional ones have been added.

Sequeira begins by discussing the histology of the skin and the morphology of eruptions in an exceedingly lucid and original method, one that relieves the usual fatigue incident to a study of the elementary lesions. He gives the student a general idea of the pathology of the skin in a few chapters, a method that has been much needed.

The third chapter, devoted to Congenital Affections of the Skin, is exceedingly valuable and includes some of the diseases which have, heretofore, not

been considered in this light. Then follow chapters on Eruptions Due to Local Irritation, Affections Caused by Animal Parasites, Affections Caused by Vegetable Parasites, including Micrococcic Infection and Eruptions Due to Drugs and Toxic Eruptions. In other words, the whole book is an attempt at etiological classification, which must at the time fall far short of our expectations, but enough is known about many of the diseases of the skin to attempt it; and it is worth while, as it adds to the student's understanding of the subject. Such a classification is preferable to that of the elder Hebra, which is the one usually followed.

Another happy method in the book is the clear, lucid, and concise way in which the author has treated the diseases. He does not confuse the student with numerous and unnecessary quotations, but gives at the end of each chapter a few important references. For one versed in dermatology this book is not of great assistance, but for the student it is a most valuable acquisition.

Some of the photographs are fairly good; others show great detail and are excellent. All the colored illustrations are fairly good, but we must say that we think all colored illustrations fall far short of the proper portrayal of diseases of the skin.

The chapter on Tumors of the Skin is disappointing, particularly the part devoted to cutaneous cancer. We expected from Sequeira, with his extensive experience on the therapeutic side of the subject, a more detailed and original treatment of the disease. He is, therefore, particularly fitted to discuss this question more fully; hence our criticism has some justification.

**A MANUAL OF PRACTICAL HYGIENE.** For Students, Physicians, and Health Officers. By Charles Harrington, M. D., Late Professor of Hygiene in the Medical School of Harvard University. Fifth Edition, Revised and Enlarged. By Mark Wyman Richardson, M. D., Secretary to the State Board of Health of Massachusetts. Illustrated with Twenty-four Plates in Colors and Monochrome, and One Hundred and Twenty-five Engravings. Philadelphia: Lea and Febiger. 1914. Price, \$5.00.

The old adage of the ounce of prevention has perhaps received less attention from physicians than from any other class in society. Although medicine has always professedly concerned itself with the prevention as well as the cure of disease, the former has, except in an indirect way, interested only to a very slight degree the average medical man. Nor has he been the leading spirit in the growing public consciousness in regard to the general health, particularly as it is reflected in the wave of so-called public health legislation which is sweeping over the country. This condition should not and cannot endure. Public health measures should be studied, planned, and fostered by the men best fitted by education and experience to understand the various phases of the subject, and these are the men with medical training. The medical profession and the medical college are awakening to this necessity. It is, therefore, not surprising that the scope of the textbook under discussion should have been altered very considerably in the present edition, and that the editor should have found it expedient to seek the collaboration of experts specializing in the various branches of public hygiene. Under this plan there has been evolved a most complete presentation which is of the greatest value to the student of the subject.

The chapter on occupational hygiene is particularly distinguished by the manner of presentation; the chapter on habitations is most complete; in fact, the entire work should meet the most exacting requirements of those interested in the preservation of health.

**A TEXTBOOK OF PRACTICAL THERAPEUTICS.** With Especial Reference to the Application of Remedial Measures to Disease and Their Employment Upon a Rational Basis. By Hobart Amory Hare, M. D., B. Sc., Professor of Therapeutics, Materia Medica, and Diagnosis in the Jefferson Medical College of Philadelphia, etc. etc. Fifteenth Edition, Enlarged, Thoroughly Revised, and Largely Rewritten. Illustrated with 144 Engravings and 7 Plates. Philadelphia and New York: Lea and Febiger. 1914. Price, \$4.00.

It is scarcely necessary to say that the present edition of this standard textbook again justifies its wide popularity. We are making rapid strides in drug therapy; empiricism is fast losing ground before the steady advance of the pharmacologist, the physiologist and the careful clinical observer. The author has been quick to incorporate these recent gains in the present edition, adding and rewriting several chapters. Salvarsan and neosalvarsan are given particular attention. In the use of tuberculin the author holds to the plan of the very small initial dose cautiously increased, a plan which seems to be gain-



ing the most adherents. However, he seems unnecessarily conservative when speaking of its diagnostic use. Many physicians are firmly convinced both of its value and its practical safety when properly and judiciously used for diagnostic purposes. In the use of vaccine therapy one cannot but approve of the author's sane view. He very properly compares the present day 'mixed vaccine' to the old 'shot gun' prescription, and sets forth very clearly the fact that much of our present vaccine therapy is pseudo-scientific. On the other hand, he gives full credit to prophylactic vaccine therapy. The newly acquired facts in cardiotherapy, the uses of pituitrin, and the many other drugs which have recently engaged the attention of investigators, have been included in the present edition so that the book is thoroughly up to date.

**DISEASES OF BONES AND JOINTS.** By Leonard W. Ely, M. D., Associate Professor of Surgery, Leland Stanford Junior University, San Francisco, Cal. New York: Surgery Publishing Company. 1914. Price, \$2.00.

The unusual interest now manifested by the profession in acute and chronic arthritis, as well as other forms of bone and joint diseases, makes this book particularly timely. The author is particularly well equipped from experience to present an authoritative work, having specialized in this particular branch of surgery for years.

This book is intended primarily for the general practitioner, but instead of furnishing that long suffering and very important person with a mass of details, and with many methods of treatment from which he may choose, the book lays down broad general principles, with the evidence upon which they are based, and then shows how these principles may be applied.

In a brief, terse way, it presents the anatomy, physiology and pathology of bones and joints, acute and chronic arthritis of various types, ankylosis, diseases of the shafts, acute osteomyelitis, chronic inflammations in the bone shafts, new growths in bone, etc.

The profuse photomicrographs with other illustrations aid materially in placing before the eye of the reader the contents of the book, and the marginal sideheads, printed in contrasting colors, permit of ready reference.

It is a book which will be much appreciated by the general practitioner and can be read with the assurance that it presents valuable instructions from an authoritative source upon a subject where much light is needed.

**PATHOGENIC MICROÖRGANISMS.** A Practical Manual for Students, Physicians and Health Officers. By William Hallock Park, M. D., Professor of Bacteriology and Hygiene, University and Bellevue Hospital Medical College, etc. etc., and Anna W. Williams, M. D., Assistant Director of the Bureau of Laboratories, etc. etc. Fifth Edition, Enlarged and Thoroughly Revised. With 210 Engravings and 9 full-page Plates. New York and Philadelphia: Lea and Febiger. 1914. Price, \$4.00.

The fifth edition of this standard textbook of bacteriology shows much in the way of rearrangement and addition to the previous edition. In every respect the book is up to date in the presentation of the subject of bacteriology and the related matter that goes with this subject. Immunity is well taken care of. There is a new chapter on the filterable viruses, and complement fixation is presented by a special writer. The practical side of bacteriology is adequately dealt with. This book, on account of the good points which have been mentioned, is not only of service to the student, but will prove of great value to the physician who wishes to be *au fait* with all the modern teachings of bacteriology.



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## EDITORIAL.

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### THE NEXT INTERNATIONAL MEDICAL CONGRESS— AND THEN.

It may be that you have lived in peace with your neighbors and it may be that you have not. It may be that you have attended your local medical society and have always restrained yourself from getting into an argument with some member whose asininity has been objectionable to you, and it may be that you have pursued such high-handed tactics in a controversy that you have been severely criticized on account of an ungovernable temper. But no matter how docile you have been or how cantankerous, those moods were the outgrowth of thought that spelled simplicity. To illustrate: The man who lauded your paper after you finished was your friend and the man who derided what you thought were your best points was your enemy. At least that is the way you felt, and it was a natural feeling, you can be assured, a natural feeling founded on healthy reasoning. You did not care whether your friend was of German, or Russian, or French extraction; the mere fact that he recognized the seriousness of your labors and gave them their just dues prejudiced you for him. Your enemy, on the other hand, was your enemy because he saw only the defects of your reasoning, because his obtuseness was so great that he failed to grasp its merits, and not because he was not a simon-pure American. Nationality was forgotten in your hatreds; you were primitive and simple; the complexities of thought which obsess us at the present moment in our estimate of the real worth of those fellowmen who are not of our birth did not weigh upon you to an appreciable degree, and the result was that your likes and dislikes were based on a just cause. In short, you were more animal than

man in your mental attitudes, but in extenuation of your uncomplicated moods one can say that you thought in a straight line.

The present European war is not going to let you continue in your simple way of thinking; it is a war of ideas, and being such must affect you in the end. No doubt you have said you are neutral; that all men are your brothers; that medical science is international and never can be national so far as you are concerned. But although you may have repeated the word neutrality to yourself many times during the day and although you may have boasted it to your friends on occasions without number, remember you are a human being of the same composition as are those whom we disparagingly speak of as the laity. This was illustrated when the now famous manifesto was put forth by the German professors and scientists, when the scientific attainments of Ehrlich did not prevent his showing his venom—a man who surely knows better than you that medicine is international; when one of the signers of the document said afterwards that never again would he breathe the same air with an Englishman. We Americans who read the document were horrified that such a state should exist in the ranks of medicine and science, but our drastic criticisms were very foolish indeed, for there is no telling that we would not be guilty of the same deplorable performance were we told continually, in case this country went to war, that what we were fighting for was not the acquisition of territory but the preservation of our most cherished ideas.

Granted that what has just been written is correct, what is going to be the behavior of the representative men at the next International Congress in 1917? Will the scenes enacted be tragical or will they be farcical? Will German be the only language tolerated or will French again rule the day? Will the English sit in the rear of the hall and twiddle their thumbs? Will the mention of Pasteur, Roux, Vincent, Metchnikoff, Chantemesse, Curie, Widal, Yersin, Haffkine, Lister, Sir William Leishman, Sir Patrick Manson, Sir Ronald Ross, Sir Almroth Wright and Major Harrison be greeted with applause by the Germans, and will the French and the English, directly the names of Koch, Pfeiffer, Kolle, Klebs, Loeffler, Behring and Ehrlich fall from German lips, acclaim them prophets and saviors of mankind? And at the height of the *melée*, which we suppose must take place if present indications are reliable foreshadowings, will the Americans show how well and how intelligently they have learned their lessons in neutrality, or will they break the leash that holds them and marshal their forces with this nation or that

nation, or will they shout with the others, just as loud and just as vociferously, about their own countrymen—Walter Reed, Carroll, Lazaer?

While we are not advocating one of those misunderstandings among medical men that bespeaks our civilization on account of the exchange of vituperative epithets and ink-stands, we must admit that the present war of ideas, if illustrated as we imagine it will be at the next International Congress, will bear some very good fruit, especially for Americans. In the first place, that much-discussed and what was thought before the present war an unanswerable question—the matter of language—will be settled once for all. Even though insults are shot across the room, even though men clutch in no loving embrace, even though hair flies in all directions, if all these untoward occurrences are brought out in a discussion as to what language shall be used at all future meetings, a great gain will be achieved for Americans. Hitherto the American issued forth from his urban or suburban home to attend a meeting of the Congress panoplied with ‘a conversational knowledge’ of French or German that had a good deal to do with knowing exactly how to tell in the simplest language whether or not ‘the garden belonged to a dear uncle or to a dear cousin or to a dear aunt,’ or whether ‘the watch belonged to a dear father or to a dear mother or to a dear grandmother.’ Of course, this was knowing a foreign language in all its gradations and twists; so what could be easier, when thus fortified, than profit by listening to a medical paper either in German or in French? Let us forget our many Waterloos in trying to follow the drift of a paper in a foreign language; let us forget our past failures and think only of the delights which will come to us when we know, some four years in advance, that French will be the language used by all, or German, or what would please us most—English. Again let us rejoice that extreme candor will be practised, the sort that will make one put up a good fight to be recognized. For many years the Congress has been a nice, polite reunion for the interchange of professional amity and sugared untruthfulness: the Englishman patted the German on the back, the Frenchman patted the German on the back, and the German patted both English and French on their backs. This was a most edifying performance, and everybody inside and outside the place of meeting was delighted, but was the science of medicine advanced to any a great degree?

As we have indicated before the matter of nationality warps judgment, breeds prejudice and abets our worst qualities when it is allowed to obtrude itself into a discussion, be it medical or lay.



But no matter how much we may deprecate its visitations in our local societies, we are inclined to think that at the next meeting of the International Congress it will work weal and not woe. It will do this because it will put to flight the art of flattery, so carefully nurtured and husbanded at all previous meetings, and it will rent the mask which would-be scientists have hitherto worn because it so happened that they belonged to the few nations the world had blandly accepted as scientific. No doubt, the next meeting will be a sorry spectacle of party passions, of blind and wilful prejudices, of raw and insulting remarks. But out of the grilling the best will survive, and at all subsequent meetings a new life will be in force, the sort that will encourage the leaven of drastic criticism and make short shrift of flattery, especially of the brand that is on a par with what Lord Beaconsfield used when he said that "with Royalty [Queen Victoria] you must put it on with a trowel." P. S.

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#### INTERPRETERS OF NATURE.

In the good old days, as the authors of penny dreadfuls usually say at the beginning of a story, it was the custom for grandfather or some kind and beneficent uncle to take us walking of a Sunday afternoon, and in case we asked questions about certain flowers or trees and showed an insatiable desire for knowledge on the subject of why a donkey did not look or behave like a horse, to be told simple fairy (?) tales that could not possibly bring the blush of shame to the cheek of the most innocent person in the world. We were told the names of the flowers, the sort of earth in which they best grew; and if our informer was of a poetical turn a bit of poetry was recited so that our childish mind would be the better impressed and perhaps made to realize how great a help flowers are to the poetic Muse. In the case of the donkey we were told at considerable length all about his trickery, his irresponsibility, his obstinacy and stupidity. And again our mentor, provided he was well read in Dickens, would recite those two delicious lines by the distinguished Englishman: "If I had a donkey what couldn't go, Do you think I'd wallop him, no, no, no." And tragedy of tragedies, all along we were in blissful ignorance of the sexual life of the flowers and how low indeed were the morals of the long-eared, short-maned quadruped!

This introduction to our little essay on 'what every boy of ten should know' was not written in a frivolous spirit, but in a spirit of deep disappointment that all sexual knowledge was withheld from us when we were young and how much purer our after-life would

have been had our mentor been less old-fashioned. We recall some terrible 'breaks' that we made in our family circle when we asked why certain ladies who called at the house were all of a sudden so much bigger around the waist than usual, and how we were told to mind our own business by our very ignorant mother. We also recall that whenever an older member of the family foolishly mentioned something that we should not hear, our mother frowned and coughed in disapproval. We were really very ignorant; so ignorant that we cannot remember ever asking our mother why our sexual organs were placed where they were, and for what purpose they were given us. In fact, we never paid much attention to them, and whether a woman in the neighborhood had four children and another had only two never aroused our curiosity. How the new baby around the corner was made was of no interest to us, and had it been, our very ignorant mother would have been hard put to explain. Of course we grew up in a wild and unscientific state, and though we think we were just as moral as are the scientifically trained boys of to-day, we are sure of one thing—our attention was not repeatedly called to the wickedness of our sexual organs and how our childish minds must control their vagaries and the dire results which would surely ensue if we did not watch their behavior continually. And we really read a lot in those days—books by Jules Verne and Captain Marryat and Louisa M. Alcott and Charles Dickens and Mark Twain, and still we did not ask the why and wherefore of our sexual organs. We were very ignorant, indeed, and must be horribly immoral now. But that's another story.

In recent years there have been so many interpreters of nature for the sake of keeping small boys from those awful pitfalls which circumvent their lives that mention even of the most distinguished authors would bore the reader too much. These interpreters started out on their campaign for the moral instruction of the small boy in a mild and sane way, and the essays which came from their pens were both instructive and agreeable reading. But we imagine like all reformers they thought their first teachings too puerile for any good purpose, and so as the months rolled by waxed more intense, more serious, more candid, until to-day we have a large number of interpreters who stop at nothing, for they insist on the small boy knowing not only the names of the various parts of his sexual organs, but also the functions of the penis, the testicles, the urethra. And as for those sexual diseases which are called 'social' by the reformers—we suppose they are called 'social' because when once acquired they insist upon being on friendly terms with us for months, if not for years—the most detailed account of them is given,

and after this deluge of knowledge, the author, so to say, sits back and says naïvely to the mother or the father: "Now see to it that your little boy and your little girl are pure, and will grow up on the lines I have laid down." . . . When shall we hear of the revolt of fathers and mothers against such obtrusively silly teachings!

Although our view of the literature that is generally put forth for the sexual instruction of the young is doleful enough to suit the most confirmed pessimist, occasionally an essay is written on the subject that is so clever, so convincing, so refined that no exception can be taken to it. Reference is here made to a chapter in Mr. Stephen Paget's book "*The New Parent's Assistant*,"\* a chapter on the subject of "*Interpreters of Nature*" that has all the perfections and none of the defects of this sort of writing. The London surgeon, known already to the medical world through his masterly "*Confessio Medici*" and his highly instructive "*Pasteur and After Pasteur*," needs no introduction to the reader, and in the essay under criticism he again shows how a subject that is invariably maltreated by vulgar minds and awkward pens can be made a most convincing performance through the magic of a literary equipment and an exquisite sense of words which belong only to the trained writer. Everything he says has been said before by refined parents to their children in case they had their confidence and knew beyond a doubt the purity of their minds, or if not said has been thought as the right sort of instruction; but even granting that there is nothing startling in his lines, no new sensation to make us more and more alert in the matter of watchfulness over the young, it can nevertheless be said in all reason that here at last is a bit of writing that must bring home to us with telling effect the whole problem as it has never been before.

How few will read this composition of simple words clothed in literary graces, and how few will understand its high purport! Surely not those who have fed their minds on the prurient teachings in most of the books on sexual hygiene. And this is the pity.

P. S.

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#### ON FEELING FIT.

Perhaps in the whole range of human thought there is no subject of the same engrossing interest as the subject of feeling fit. True, obesity is not lacking in importance, but this terrible curse, as our

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\*London: Smith, Elder and Co. 1914.



lay journals have it, is not so frequent that it should invite our pitying glances and our deepest sympathy. But to be out of sorts or in a bad shape, as the popular speech puts it, is very frequent with all of us, so frequent, indeed, that the opposite feeling of being fit, when its gracious presence condescends to envelop us, ought to be treated with the greatest consideration. In a recent issue of the *Nation* (London) an essayist writes a number of wise words on the subject of feeling fit and is quite enthusiastic on mountain climbing as a means to banish lassitude, short-windedness, and the lethargy that is bound to come over us if we follow too closely and too assiduously only the dull routine of life. Unfortunately, all of us do not live near enough to mountains to enjoy these great advantages, let us say once a month, the majority of mankind being nearer the slums than even the broad streets filled with fresh air. Think of the physicians who must feel fit every morning before they make their round of calls, and what a poor impression they would make on their patients were they even, for a moment, to betray their real feelings of being unfit! No one can expect a person who has sat up for hours with a patient to feel in prime condition the next morning, and no one would attempt the masquerade but one whose livelihood depends on his suavity, his graciousness and his general appearance of physical and mental well-being. This is the physician's small undertaking here on earth; and just because he must get into harness daily and look as if he could run a mile or two and never be short of wind, when the truth is that even ten paces would be followed by languor, his lot is to be envied of the rest of mankind. He seldom sees mountains, or rather seldom has the opportunity to climb them and drink in the rarefied air; hence, we are quoting the following lines so that some idea may be conveyed to him of the opportunities some fortunate mortals have to vanquish a depressive physical and mental condition:—

“In the dictionary sense of the term, to feel fit is not so very much. It means that one is able to get up in time to catch the 'bus to the office, to go through a day's work that habit has made almost automatic, to eat one's lunch without indigestion, and to leave a surplus of energy for some more or less lethargic recreation in the evening. If the machine begins to run seriously below that minimum, we call in the doctor to tune it up again, and as he usually seizes the opportunity to overhaul it well and to bring it into a condition more than fit for the daily round, we may then experience the delight of being super-fit or 'feeling fit.' As for catching the 'bus, we could race it to the city without turning a hair; work is a dear

friend well met; the world which was a burden upon the back becomes a plaything in the hand.

"Whatever there was in us, however out of practice, comes into full bloom again, when the blood has been set going at its best pace. It seems indeed as though faculties we never had before were added to us. We were babies, sometimes excitable to a desire quite incompatible with the inaccuracy of our limbs and organs, like the whiskered gentleman in 'Punch' who feels an exiguous biceps when he reads the prize-fight bills. But now we are youth with a hatchet warranted to cut anything, and we are looking for something to cut with it. With what a swift, sure stroke we could cleave an enemy to the chine; how easily could we carry a fair lady from a burning house; there is no problem to affright the intellect, no negotiation that would try the nerve. We have set ourselves progressive tasks, and conquered them one by one. The harder they were, the easier they became. We are at the top of our form, and by comparison with our old self and therefore with ordinary men, are as knights in armor among naked savages.

"It must be very few of the thousands who watch a boxing contest or a football match who go away with a resolve to get for themselves a body and a wind like those bruisers or kickers. It would be wonderful to have muscles that could be stiffened to protect the diaphragm like a belt of steel, or flesh that could be hammered to pulp to-day, and become sound by the day after to-morrow. But the trouble and expense are too great. First-class pugilism or football is the examination system in athletics carried to madness. If they can excite in us (as they seem but little able to do) some general will to be superior instead of barely equal to the common task, that is as much as can be expected of them. Mr. Sandow's disciples, who probably never watch football matches, are, we suppose, always in training, and therefore always 'stale'; they work upon the development of an imperfect catalogue of muscles, and could no doubt get each of them extraordinarily well-grown, and yet leave the body and faculties untrained. And the real joy of fitness cannot be experienced every day of the year. It must be a matter of sudden wonder, the treat of a week or so between months of 'feeling so-so.' And it must come as a gift owing to no sordid merit, such as the punch-ball or the horizontal bar.

"There is first the joy of becoming fit, and it begins with the full knowledge of how unfit we were. When we start for the summit of our holiday mountain, we look out the distance on the map, and it is nothing—about as far as from the Post Office to Marble Arch. We take no notice of the contour lines, because it has never mattered to us whether Cheapside dips towards St. Paul's or towards the Mansion House, or whether we walk up Fleet Street or down it. And we wonder what is the matter with us when the very gentle

walk over the plinth of the mountain makes us extremely hot and desirous of sitting down. When the path tilts a few more degrees toward the perpendicular, we discover that we have no lungs. We are puffing rapidly, like a horse that has been galloping. The temples seem about to burst, the mountain heaves under foot, and we stumble instead of walking. We should deem it impossible for human effort to go another step, were it not a fact that our walking companions, who are little better than ourselves, still keep on. At last the halt comes; we are glad to find that the others are as glad of a rest as we are, and we feel that we have done more than we thought ourselves capable of.

"The fact is that when the lungs labor like that, they are not calling out in vain. The best thing that we can do is to compel them to keep a slightly slower measure than they appear to wish for. It hastens the consummation they are laboring after, the opening up of breathing-folds tucked away unused for a year past, because our slow life on flat pavements has had no need of them. Mile by mile we get larger lungs, and drink with more and more ease the bright mountain air, which is probably 1-10th per cent. richer in oxygen than the air of the city. Instead of collapsing or flying into little bits, we get that unbelievable marvel in athletics, the second wind. Instead of puffing and shaking, the engine works smoothly. We spurn the mountain, and kick it away beneath us; we stand at the cairn, and are amazed at our late faint-heartedness.

"It would not be the same if we rode a bicycle a hundred miles; still less if we lifted the dumbbell an enormous number of times. The bicycle takes us simply to a new place of the old kind, the mountain path to a new kind of place. The eye expands as much as the lungs (if the view be clear), the imagination expands, and it is perfectly demonstrable that the skin must expand. Just as the boiling-point of water is less upon the mountain-top, so the exhilaration-point of blood must be lower. All the same, we should not think of recommending a mountain with a lift, like Snowdon. We must take the rarefaction step by step. The benefit of the view is partly real and partly a trick. If there is no view, it is as fine to look over the edge of the rock into thick mist, and think that the world ends there. It is well to find that we can feel the stream of a driving mist through the clothes, and enjoy it. It is as though, having hitherto regarded the body as an encumbrance, we had suddenly discovered it to be an engine of power and of motion. Descending from its climb, at its evening bathe, it swims the estuary, or it plays tennis as though it were not ten years out of practice; it has found a voice that can sing the forgotten songs with precision and wonderful force, an eye to find a moth on the tree-trunk, a nerve to seize the adder by its tail.



"Crichton is no longer admirable when the main spring is rusty, or when only one wheel is lugubriously driven for daily bread. The quickening of his force not only drives that wheel with new speed, but sets in motion all the faculties that he ever trained. We cannot tell how the boxer feels when he has got supremely fit for his single trade—whether he thinks he could fight as well with battle-axe or plan a naval campaign—or how he feels when he has tried the task for which he trained, and perhaps failed. The man or woman who becomes fit at the end of the summer holiday courts no disillusion, or at any rate no swift one. By comparison with the common task, the new health is as superlative as it seems; we are millionaires, because the bank balance is out of all proportion to the largest cheque we have to draw."

P. S.

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#### LITERARY NOTE.

A very readable and well-written book has recently come to our desk that has so many outstanding points that the critic who scamps his criticism thereof is really guilty of a great injustice. Mr. Stephen Paget in "*Pasteur and After Pasteur*" (Adam and Charles Black, London, 1914) has written a beautiful tribute to the memory of the distinguished French scientist, and his sympathy with his subject is no less striking than the genuineness of his regard for all the great qualities of this extraordinary man. Vallery Radot's "*Vie de Pasteur*" has been used as the source for material, but this does not mean that there is the slightest tinge of plagiarism in the volume before us, for Mr. Paget is too original a thinker himself and too independent a writer to lapse into this fault. Anyone who thinks that he is familiar with the history of medical research in the nineteenth century should not be too cocksure of his knowledge, for he might be tripped up, not once but many times, by one who has conned this book with profit. There are pages of information that are written with great simplicity and there are pages that give a deal of information in a concise manner without doing any harm to the subject. Prolixity is tabooed, and this, indeed, is a virtue in any book that tries to give a history of the progress of science. But let no one read this book who thinks that only Germany has produced scientific men; he will be disappointed, and what is worse he will be thrown into a highly contentious state which is always a bad condition for any reader to be in if he really wants to enjoy a book. Pasteur was as lovable as he was great, and it is to the man as much as to the scientist that the author directs his attention. Mr. Paget holds the sort of pen that can do full justice to a man's character, and even though at times the reader may think that his praise of Pasteur, the scientist, is too great, he cannot withhold his admiration when reading of Pasteur, the man.

P. S.

## ORIGINAL ARTICLES.

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### THE ARTIFICIAL CULTIVATION OF THE VARIOLA-VACCINE VIRUS.

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By FR. PROESCHER, M. D., of Pittsburgh.

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Since the inauguration of modern bacteriological methods by Koch, the problem of the etiology of variola has been the center of interest to many investigators. In spite of all previous efforts with the generally known staining and cultivation methods, the causative agent, *i. e.*, the specific micro-organism of this important and interesting disease could not be made visible or cultivated.

A critical review of the more important work dealing with the investigation of the etiology of variola vaccine shows that some of the investigators appear to have rendered certain structures, bearing an etiological relationship to this disease, visible. Both on account of their inability to duplicate results and on account of the technical difficulty to make these structures visible, the majority of the critical investigators, however, did not accept these findings as final. Certain cell inclusions, the so-called Guarneri bodies, are generally accepted as diagnostic proof of variola-vaccine infection.

In studying certain filterable viruses, as rabies,<sup>1</sup> poliomyelitis<sup>2</sup> and variola,<sup>3</sup> I have shown the conception that these filterable viruses were invisible, to be erroneous, and, furthermore, that they could readily be made visible by staining with certain aniline dyes of the thiazine group, such as methylene azure, methylene violet, etc.

Flexner and Noguchi<sup>4</sup> confirmed my findings in poliomyelitis,\* using my staining method with the free methylene azure base to make the virus in smears, and sections of the infected central nervous system, visible. The successful cultivation of the poliomyelitis virus by Flexner and Noguchi confirms my microscopical findings that these structures are true micro-organisms and not cellular degeneration products. In a recent publication<sup>5</sup> I reported on the

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\*Flexner and Noguchi liberated the methylene azure base from the Giemsa solution with sodium hydroxide, actually using my method.

successful cultivation of the rabies virus. The micro-organisms cultivated from the central nervous system of rabetic animals are identical with those found microscopically by staining with methylene azure. The microscopical findings in variola humana and variola-vaccine virus, which I reported three years ago, seem not to have attracted attention, in spite of their importance.

In the following paper, I wish to report further on the tinctorial studies on variola-vaccine virus and experiments on its artificial cultivation.

Before describing my further investigations, I wish to discuss briefly the more important previous attempts to stain and cultivate the variola-vaccine virus. Since Koch and Wassermann<sup>6</sup> have shown that the extreme infectious pustular contents of human variola, before the suppurating stage, were entirely free of any known micro-organisms which could be stained or cultivated with the usual methods, and since Negri<sup>7</sup> and others have shown the filtrability of the variola-vaccine virus, the findings which were obtained with the common bacteriological methods can be rejected.

Von Prowazek<sup>8</sup> has definitely shown that the much discussed Guarnieri bodies<sup>9</sup> are neither a protozoon nor the causative organism of variola, but merely a specific reaction product formed under the influence of the variola virus and of important diagnostic value. Their presence in the infected epithelial cell (cornea, integument) allows us to make the diagnosis of variola vaccine without knowing the causative micro-organism.

The Guarnieri bodies are found in the cytoplasm of the infected epithelial cells, usually near the nucleus. They are of various sizes and shapes in the form of a dumb-bell, globoid or oval bodies sometimes with numerous small chromatin bodies in their centers. During the acme of the pathological process they are very numerous. They are easily stained with any of the usual aniline dyes or hematoxylin and, according to Hueckel,<sup>10</sup> originate from the cytoplasm.

Von Prowazek found besides the Guarnieri bodies certain structures which he designed as 'initial bodies' and believed that these formations were a certain developmental stage of the variola-vaccine virus. These are found also intraplasmatic, in the form of reddish stained alveolar bodies containing one to two bluish cocci-like formations. They have a maximal affinity for the Giemsa stain (methylene azure) if bichloride is used for fixation. Von Prowazek believed that the variola-vaccine virus multiplied in the epithelial cells and that the typical cell changes were due to the intracellular multiplication of the virus. After destruction of the cells the virus is liberated.

In 1906 Paschen<sup>11</sup> reported the presence of numerous small roundish bodies in smears of the contents of vaccine pustules of



children stained by Giemsa's method. The minute pale stained bodies seem to be divided into two parts which are connected by a very fine filament. The same bodies he found in sections of vaccine pustules of calves and in the vaccinated cornea of rabbits. In smears of variola humana stained with carbolfuchsin (Borrell's method), he found identical bodies in great numbers. That these bodies are not artefacts but some form of micro-organisms, he confirmed in native smears of vaccine examined with the dark-field illuminator, showing bodies of the same size and morphology. On account of their extremely small size he expressed no definite opinion as to their significance.

Volpino<sup>12</sup> examined the epithelial cells of the vaccinated rabbit cornea with the dark-field illuminator and found a great many .4 to .5 micron roundish or oval, very mobile, slightly light refracting bodies, mostly intracellular, either isolated or in large clumps. He found them only in variola vaccine. In smears, they could be stained with a diluted Giemsa solution, but, only the intracellular not the extracellular bodies. Extracellular, they were few in number. With bile, or 10 per cent. sodium taurocholate, they are rendered immobile or partially destroyed. Von Prowazek and Paschen could not confirm the motility of these bodies in the vaccinated cornea.

During the small-pox epidemic in Rio de Janeiro, von Prowazek and Beaurepaire<sup>13</sup> were able to demonstrate in smears of the filtered pustular contents, which were stained with Loeffler's mordant and carbolfuchsin, the same bodies as Paschen demonstrated in variola vaccine. They could be faintly stained with carbolfuchsin, thionin and Giemsa solution, but were Gram negative. Unstained, they were very small, slightly light-refracting bodies. They multiplied like cocci. Agglutination of the organism with vaccine serum could not be noted.

In 1913, I described<sup>14</sup> an azurophile micro-organism (Figs. 1 and 2) found in the pustular contents of variola humana and variola vaccina. The pustular contents of twenty cases of human variola which, with the common cultural and microscopical methods proved to be entirely free of any known micro-organisms, showed with methylene azure (substantive staining only) a great many intracellular and a few extracellular micro-organisms. The micro-organisms found were of the following morphologic characteristics: Very short oval bacilli isolated or in diploform or in groups or in short chains, very small diplococci in the form of pneumococci and bean-shaped diplococci, divided by a pale-stained zone; also large round cocci, sometimes divided into four parts like tetragenus, their size ranging from 0.2 to 1 micron. The majority of these micro-organisms were intracellularly located and quite often inside the nucleus. Some of the epithelial cells were entirely filled with these

micro-organisms. Extracellular, they were few in number. Micro-organisms of the same morphology were found in different strains of variola-vaccine virus. The huge majority of the extracellular organisms could not be made visible by substantive staining with methylene azure.

Of the numerous previous attempts to cultivate the variola-vaccine micro-organisms, I wish to refer only to the more recent investigations. In an article<sup>15</sup> ten years ago, I reported the cultivation of an invisible virus cultivated from variola vaccine which produced up to the fourth culture, by innoculation in a heifer, small but distinct pustules. The vaccinated rabbit cornea showed Guarneri bodies. The virulence of the culture was lost after the fourth subculture, but the avirulent culture could be kept up to the thirtieth generation when further subcultures could no longer be obtained. The culture-medium used was horse blood plasma.

Bélin reported in 1909 to the Académie de Paris the apparently successful cultivation of the variola-vaccine virus. He used as culture medium serum-bouillon and coagulated serum which was inoculated with potent vaccine filtrate and otherwise sterile tissue of vaccine pustules. The inoculation in animals was doubtful; since his first publication no other successful experiments were reported.

The latest experiments to cultivate the variola-vaccine virus are those of Fornet.<sup>16</sup> He used in his culture experiments vaccine virus which was sterilized by ether from bacterial contamination. The cultures were made anaerobic in serum-bouillon. The inoculation of the sixth subculture in a heifer apparently produced typical pustules. The microscopical examination of the cultures showed a great many small bodies. He designated the organism as *microsoma vaccinæ s. variolæ*.

Gins<sup>17</sup> who repeated the experiments of Fornet could not confirm his findings. He has not been able to sterilize contaminated vaccine virus with ether, without destroying the virulence of the virus. Culture experiments with an otherwise sterile but potent glycerinated variola-vaccine virus using serum-bouillon, extracts of rabbit's skin with and without native serum, coagulated rabbit's serum and serum-bouillon, according to Taroszi, as culture media, were entirely negative. A growth of the virus could not be noticed in any case.

Microscopical examinations of the cultures with the dark-field illuminator showed the same bodies as observed by Fornet. They could also be found in the controls. Gins believes that these formations are unspecific bodies and have no relation to the vaccine virus. The animal experiments of Fornet are doubtful as the inoculation of the animals were not conducted with the necessary precautions, so that a spontaneous infection with the vaccine virus

could be excluded. Inoculations in the rabbit cornea were not made, in spite of its important diagnostic value.

If we summarize the present status of our knowledge of the variola-vaccine virus we come to the following conclusions: The virus is a filtrable micro-organism. With the dark-field illumination, a great many extremely small roundish bodies, slightly light-refracting, can be seen. With the usual substantive staining methods, as carbolfuchsin, thionin and Giemsa solution, similar bodies but very faintly stained and difficult to differentiate from stained protein matter can be made visible. With Loeffler's mordant and carbolfuchsin, the bodies are stained a reddish tint more distinctly. During the intracellular growth of the variola-vaccine virus, specific cellular reaction products are formed. The so-called Guarnieri bodies are of cytoplasmatic origin and not protozoa. Besides these intracellular inclusions there are found sometimes, but not regularly, von Prowazek's 'initial bodies,' which are probably some development stage of the variola-vaccine virus. With none of the above-mentioned methods could an exact proof of the nature of the variola-vaccine virus be ascertained. The substantive staining with the free methylene azure base revealed the long sought intracellular location of the variola-vaccine virus as a well-defined micro-organism in form of diplobacilli and diplococci. The huge mass of the extracellular form of the virus could not be made visible by substantive staining with methylene azure.

The former attempts to cultivate the variola-vaccine virus are doubtful. Whether these are true cultures or the original virus diluted, accidentally carried over into the subcultures and producing the disease, is open to question. It is to be regretted that almost all the investigators who claimed to have successfully cultivated the virus, neglected to inoculate the subcultures into the rabbit cornea to demonstrate the presence of the Guarnieri bodies which are generally accepted as the most important diagnostic sign of variola-vaccine infection and the final proof of the specific character of true subcultures.

#### FURTHER TINCTORIAL STUDIES WITH VARIOLA-VACCINE VIRUS.

To exclude all errors due to common bacterial contaminations, a completely sterile, but highly potent variola-vaccine virus was exclusively used for the following investigations. A large quantity of vaccine virus was kindly furnished us by the National Vaccine and Antitoxin Institute at Washington, D. C. The vaccine virus proved aerobically and anaerobically on all common culture-media completely sterile after an incubation of fourteen days. Vaccination in the rabbit cornea showed typical vaccine keratitis with many Guarnieri bodies (Fig. 7).



The microscopical examination of the undiluted original vaccine by means of the dark-field illuminator showed a great many slightly light-refracting very small cocci and also diplococci, mostly closely packed together in irregular clumps. Epithelial cells, which were filled with larger diplococci, were also seen. Some of the cells were entirely filled, others showed only a few of the organisms (Figs. 3 and 4). Vital staining of these organisms with different aniline dyes as brilliant-cresyl blue, Nile blue, neutral red, etc., either in the original glycerinated vaccine or after washing with salt solution and centrifuging, was not possible. For further tinctorial studies 0.2 to 0.3 c.cm. of the glycerinated virus was diluted with sterile .8 per cent. salt solution and centrifuged in a high speed centrifuge (3,000 revolutions per minute) and thin smears made on cover-slips from the minute sediments so obtained. The air-dry smears were fixed in methyl alcohol and stained with diluted carbolfuchsin, methylene blue or Giemsa stain, but no micro-organisms could be seen. Other smears were stained according to Borrell's method. The smears were first floated for ten minutes on Loeffler's mordant at 60° C., then thoroughly washed in running water and stained with concentrated carbolfuchsin for ten minutes at 60° C., washed again, dried and immersed for a few seconds in absolute alcohol, then washed with distilled water, dried and mounted in Canada balsam. In place of carbolfuchsin, carbol-methylene azure or carbol-neutral red can be used. In perfectly stained and well differentiated smears a great many deep red or blue stained small cocci closely packed together were made visible (Fig. 26). In places where the micro-organisms are widely separated, they appear as well-defined cocci or diplococci and some also as diplobacilli. They are morphologically identical with the micro-organisms seen extracellularly by dark-field illumination. The organisms seem to be identical with those seen by Paschen and von Prowazek. The photomicrographs and drawings, published by these authors, show the micro-organism to be widely separated, and it is rather difficult to decide if they are micro-organisms or stained protein matter. Control specimens made of sterile serum or other pustular skin affections did not show any structures resembling the above cocci. The average size of the cocci is about 0.3 to 0.4 micron. The reason why the extracellular form of the variola-vaccine virus cannot be stained substantively with methylene azure, I am not prepared to state at present. It is also very difficult to stain the intracellular form of the virus, in using glycerinated virus; it is necessary to dilute the original virus with bouillon (1/10 c.cm. to 10-15 c.cm. of bouillon) and to incubate for four to five days, after which the bouillon is then centrifuged, the sediment washed once or twice with salt solution and smears made from the minute sediment. After fixation with methyl alcohol and staining with carbol-methy-

lene azure, the intracellular form is easily visible while the extracellular micro-organisms are unstained (Figs. 5 and 6).

It is very likely that this preservation in glycerine changes the chromatophilic haptophores and makes the substantive staining impossible.

Further microscopical proof that the above-described organisms are the etiological agent of variola vaccine is supported by the microscopical findings in the vaccinated rabbit cornea. The inoculation of the variola-vaccine virus into the scarified rabbit cornea produces the so-called vaccine keratitis (Fig. 7). The microscopical changes in the vaccinated cornea are quite typical. About twenty-four to forty-eight hours after the vaccination, a slight protrusion with an incipient clouding at the seat of inoculation is noted.

The other parts of the cornea as well as the conjunctiva remain almost free of inflammation if the vaccine contains no other pathogenic micro-organisms. After forty-eight hours the epithelium is distinctly thickened and clouded, due to a proliferation of the variola-vaccine virus.

The changes are still more pronounced after seventy-two hours. After three or four days, the protruding epithelial tumor is exfoliated and a small ulcer remains, which in course of eight or ten days slowly heals up, leaving a whitish scar which will, in time, entirely subside. The microscopical examination of the vaccinated cornea forty-eight or seventy-two hours after inoculation shows the following histological picture. At the seat of the vaccination and its surroundings, almost every epithelial cell contains the above-described Guarneri bodies. The largest and unstained forms are found near the inoculation center. They are smaller and more intensely stained toward the periphery. Some of them are surrounded by a halo. They are also found in the connective-tissue cells, and in the intracellular substance of the cornea. For the detection of the Guarneri bodies, either Ewing's method or the vital staining with azure II, according to Gins, or staining of the thin paraffin sections with iron, hematoxylin or Giemsa solution may be used. If one expects to find only few Guarneri bodies in the clear cornea the section method only should be used. In order to make the intracellular as well as the extracellular form of the variola-vaccine virus in the vaccinated cornea visible with methylene azure, the smears must be fixed in bichloride-alcohol. At present the following method is employed for the detection of the virus in the inoculated cornea. Scrapings are made with a sharp scalpel from the vaccinated cornea twenty to forty-eight hours after inoculation. The removed corneal cells are suspended in a small drop of 0.85 per cent. salt solution and gently crushed between two cover-slips. The moist smears are immediately immersed in bichloride-alcohol solution (2 parts concentrated aqueous bichloride

solution and two parts absolute alcohol) at 50° C. The smears are allowed to remain in this solution for about thirty minutes until room temperature is reached. The smears are then washed in 70 per cent. alcohol and immersed in iodine-alcohol (5 c.cm. cone official iodine tincture and 45 c.cm. 70 per cent. alcohol) for ten to fifteen minutes. The iodine-alcohol is drawn off and replaced by 70 per cent. alcohol until the iodine is washed off and the smears gradually immersed in 60, 50, 40, 30, 20 and 10 per cent. alcohol, respectively, and finally washed in distilled water. To remove the last traces of iodine the smears are now immersed in aqueous 0.5 per cent. sodium hyposulphite solution for ten to fifteen minutes and then thoroughly washed with distilled water. If the smears are not immediately stained, they can be kept for several hours in distilled water. For staining, the moist smears are floated on 1 per cent. carbol-methylene azure for thirty to fifty minutes, washed with distilled water, dried between filter paper and mounted in thick cedar oil or paraffin oil. In the latter case the cover-slips are sealed with a melted mixture of rosin and beeswax. The mounting in Canada balsam is not advisable as the methylene azure is very sensitive to acids and the specimens will be decolorized after a short time.

The microscopical examination of the smears shows the following details. The protoplasm of the corneal cells is pale blue, the nuclei dark blue, the Guarnieri bodies from light to deep blue or metachromatic violet, showing sometimes a few deeply stained granules. The majority of the corneal cells show micro-organisms in form of cocci or short oval bacilli, stained a deep blue, either aggregated in large conglomerates or in short chains or in diploforms. Some of the cells are entirely filled, others only show a few micro-organisms in the protoplasm and sometimes also in the nuclei. The extracellular form is not very numerous. The size of these micro-organisms varies between 0.2 to .1 micron. They resemble closely the organism found in *variola humana*. I wish to designate this form of the *variola-vaccine* virus as the 'intracellular form' (Fig. 11). Besides this large form there are seen also much smaller cocci, which are just within the limit of the microscopic vision. The majority of these extremely small cocci is extracellularly located, few are found intracellularly. They are arranged in small or large conglomerates, and are very difficult to differentiate from stained protein matter. They are stained a metachromatic violet. These cocci undoubtedly originate from the larger intracellular form as can be clearly seen from the photomicrographs 8 and 9. On account of their extremely small size the original photograph is enlarged to show their proper origin. The photomicrograph (Fig. 8) shows in the lower right quadrant an epithelial cell, which is filled with a great many of the larger intracellular cocci. Below the mark X an aggregation of small cocci is seen, which originates



from the larger cocci in the centre. They seem to be expelled from the protoplasm and are found extracellularly in large masses. They may be designated as the 'extracellular form' of the variola-vaccine virus.

That these micro-organisms bear a direct etiological relationship to the variola-vaccine virus is further evidenced by the presence of the Guarnieri bodies, as shown in photomicrograph No. 10. Besides the micro-organism there is also seen one or more of the typical cell inclusions.

These findings confirm von Prowazek's hypothesis that the virus multiplies intracellularly, but there is still some further proof of von Prowazek's previous observation. The initial bodies described by this author sometimes but rarely found within the plasma are stained faintly bluish red, with Giemsa solution and are nothing else but the intracellular form of the variola-vaccine virus. The *experimentum crucis*, that the initial bodies of von Prowazek's are the large intracellular forms of the variola-vaccine virus are demonstrated in the following manner. If the corneal scrapings of a vaccinated rabbit cornea are stained with Giesmsa solution after fixation with bichloride-alcohol, the initial bodies are found in a few cells. Restaining of the same smear with carbol-methylene azure shows the same formations, stained distinctly deep blue in the form of the above-described diplococci and diplobacilli, besides many other intracellular micro-organisms not made visible by the Giemsa stain.

If we summarize briefly the microscopical findings of the development cycle of the variola-vaccine virus as observed in the rabbit cornea, we come to the following conclusions:—

The variola-vaccine virus multiplies within the cell both in the plasma and in the nucleus. The intracellular forms are large diplococci or diplobacilli with an average size of 0.2 to 1 micron. They are easily stained substantively, as well as adjectively. After fixation with bichloride-alcohol, they are stained deep blue with methylene azure. The extremely small extracellular forms, which seem to be expelled from the protoplasm and to be extracellularly located, originated from the large intracellular forms. After fixation with bichloride-alcohol, they are adjectively stained metachromatic violet with methylene azure. They represent the huge majority of the variola-vaccine virus. The initial bodies described by von Prowazek are the large intracellular forms of the virus.

#### CULTIVATION EXPERIMENTS.

As stated above, the successful cultivation of the variola-vaccine virus and the production of the disease in susceptible animals with subcultures, carried far enough to exclude the possible transmission of a diluted but still potent virus, has not as yet been established be-

yond doubt. The great intransgressible difficulty seems to be the attenuation of the virus if kept at 37° C. for a long period. It is a striking fact that the virus within the animal body multiplies at body temperature without losing its virulence. The attenuation of the glycerinated virus at 37° C. is very likely due to the glycerine. If the diluted glycerinated virus could be brought under more favorable conditions to multiply *in vitro*, its virulence at 37° C. would probably be preserved for a longer period.

The culture experiments were carried out in the following manner: Sterile test-tubes were filled with 15 c.cm. of sterile unfiltered ascites, sheep serum and human serum and a small piece of aseptically removed kidney, spleen or liver from a guinea-pig was then added. The tubes were incubated for forty-eight hours at 37° C. and before inoculation were tested for sterility, aerobic and anaerobic. The sterile tubes were inoculated with 1/10 c.cm. of the sterile variola-vaccine virus and transferred to a Novy anaerobic jar, having its bottom covered with an aqueous solution of pyrogalllic acid. After hydrogen was passed through the jar for one-half to one hour, about 10 c.cm. of concentrated sodium hydroxide solution was poured through the gas feeding pipe and the last traces of oxygen were removed by a stream of hydrogen for ten to fifteen minutes. The jar was then incubated at 37° C. for ten to fourteen days. No appreciable changes in the culture medium were observed. After five to six days, the tubes showed a very slight opalescence by reflected light and a scanty, flaky sediment was observed around the tissue fragments. After fourteen days' incubation, the tubes were removed from the anaerobic jar and a small quantity of the culture medium taken from each tube by means of a sterile glass pipette and then inoculated in plain bouillon and grape-sugar agar. Tubes showing common bacterial contaminations were rejected. The microscopical examination of the apparently sterile tubes with the dark-field illuminator showed the same micro-organisms as observed in the original vaccine virus. The control tubes showed only fragments of leached tissue. Smears stained with Gram and counter-stained with carbolfuchsin showed a great many very small faintly stained Gram negative cocci, either isolated or in short chains or in larger or smaller aggregations which were not well differentiated. Subcultures made in ascites or serum-bouillon (1:1) kept anaerobic at 37° C. for several days showed no change in the culture medium. The culture medium kept clear, only a slight flocculent sediment was noted on the bottom of the tube. The microscopical examination of the sediment showed the same micro-organisms as found in the primary culture but less in number. Further anaerobic subcultures in the same culture medium with and without fresh sterile tissue did not show any growth. Inoculation of the sediment of the primary culture in the rabbit

cornea showed, after forty-eight hours, the typical Guarnieri bodies and many intracellular micro-organisms. The primary culture was also still virulent but the question arises, Is this due to the original virus diluted but still maintaining its virulence in the native protein fluid?

Further culture experiments were carried out with the addition of various carbohydrates such as maltose, lactose, glucose, levulose and glycerine (1 to 2 per cent.) to the ascites or serum-bouillon. If the primary culture was inoculated in ascites or serum-bouillon containing one of the above-mentioned carbohydrates (with the exception of glycerine) a marked visible growth was noted after several days' incubation under anaerobic conditions. The addition of maltose appears to have the greatest influence causing a luxuriant growth. It sometimes takes several days until the first subcultures show a visible growth, consisting in a marked clouding and formation of a flocculent sediment. After the third or fourth subculture in the same culture medium, a marked growth is usually observed in sixteen to twenty hours. Up to the present time, the vaccine virus has been passed through the twenty-ninth subculture in either a maltose or lactose ascites bouillon.

#### CULTURE EXPERIMENTS WITH FILTERED VARIOLA-VACCINE VIRUS.

The filtration experiments of Negri, Casagrandi and Paschen demonstrated that the variola-vaccine virus can be filtered through Berkefeld filter V and N, after careful emulsifying and proper dilution.

The filtration experiments were carried out in the following manner: The variola-vaccine virus was rubbed up in a mortar with washed sea-sand for half an hour and then diluted with sterile salt solution to a 1 per cent. solution. The emulsion, together with the sea-sand, was agitated in a shaking apparatus for three consecutive days and then filtered through filter paper. The slight, cloudy filtrate was mixed with a few drops of a pyocyanus culture in order to ascertain the efficiency of the filter and then passed through a Berkefeld filter N, under a vacuum of 25 in. of mercury in about fifteen minutes. The entire filtrate, about 90 c.cm., was used for cultivation. Nine test-tubes filled with 50 c.cm. sterile sheep serum, to which a piece of sterile guinea-pig liver was added, were inoculated with 10 c.cm. of the filtrate and kept at 37° C. under anaerobic conditions as described above.

Controls in plain bouillon and grape-sugar agar showed no bacillus pyocyanus or other bacterial contamination.

After fourteen days' incubation, subcultures in maltose serum-bouillon were made and the same micro-organisms cultivated as from the unfiltered original virus (Fig. 25).



## THE CULTURAL AND MORPHOLOGICAL CHARACTERISTICS OF VARIOLA-VACCINE VIRUS.

Growth occurs best at 37° C. The virus is a facultative anaerobic micro-organism but thrives best under anaerobic conditions. The most favorable culture medium is at present ascites or serum bouillon (human, horse, sheep or calf serum) with the addition of 1 per cent. maltose, lactose, glucose, levulose or sucrose. Ascites maltose or lactose bouillon shows a general cloudiness with a heavy flocculent sediment on the bottom of the tube after sixteen to twenty hours' incubation at 37° C. The maximum growth is reached after forty-eight hours. The clouding clears after eight or ten days, leaving a whitish sediment on the bottom of the culture tube. Fermentation tubes containing litmus-ascites bouillon with the addition of glucose, levulose, sucrose, maltose or glycerine, show no gas formation but all the carbohydrates are fermented with the production of acid. The glycerine is not changed. The profuse clouding is due to coagulation of the protein of the ascites.

In ascites or serum bouillon without the addition of carbohydrates a very scanty growth is noted and the culture medium remains clear. In glycerine-ascites bouillon with a concentration of glycerine as high as 10 per cent., a slight growth is noted without clouding of the culture medium. In plain bouillon (neutral or slightly alkaline) no growth is seen, but with the addition of one of the above-mentioned carbohydrates, a fairly good growth is noted. In high maltose or glucose agar, a profuse clouding appears after twenty-four to forty-eight hours. By low magnification the clouding consists of numerous small roundish or irregularly shaped minute colonies. On slant ascites-maltose agar, a very scanty almost invisible growth is noted, consisting of numerous very small dew-drop like colonies. At low magnification, slightly elevated roundish or oval colonies are seen with a more or less uniform edge, showing very finely granulated surfaces (Fig. 29).

The microscopical examination of an ascites bouillon culture with the dark-field illumination shows a great many cocci arranged in small or large agglomerates, short and long chains, diploform and isolated cocci. As stated above, the micro-organisms from the primary culture are faintly stained with the common aniline dyes. After several subcultures they can be distinctly stained with carbolfuchsin, methyl violet, thionin, etc. The majority of the organisms are Gram negative; some of the larger forms are more or less Gram positive. Smears made from a twenty-four-hour-old ascites-bouillon culture (Fig. 27) stained with Gram and counter-stained with diluted carbolfuchsin, shows the following: agglomerates of closely packed cocci of various sizes and shapes, short and long chains of cocci, diplococci and a few isolated cocci. The size of these

micro-organisms ranges between 0.2 and 1 micron. The large forms are more deeply stained than the small. The cocci are either round, bean- or lancet-shaped, some appear as oval short bacilli, their arrangement closely resembling pneumococci, gonococci and tetragenus. The chains are composed of diplococci of various shapes and sizes, either straight or curved. The polymorphism of these cocci is due to the multiplications in different planes. The larger forms seem to divide in one plane, resulting in the formation of chains and remain more or less connected, while the smaller forms are divided into two or three planes, giving rise to irregular or cubical masses.

#### ANIMAL INOCULATION.

The final proof that the micro-organisms described and cultivated are the causative agent of the variola-vaccine virus is verified by inoculation in the cornea. On account of the danger of spontaneous infection, inoculation in calves has not as yet been made. The rabbit cornea is a more sensitive reagent for the variola-vaccine virus than the epidermis. The presence of the Guarnieri bodies in the inoculated cornea is an unmistakable sign of a variola-vaccine infection, as these cell inclusions are found only in this disease.

The question if the subcultures are virulent enough to produce vaccine pustules either in calves or human beings is more a practical than a scientific one. The technique of the inoculation of the subcultures in the rabbit cornea is as follows: The cornea is anesthetized with a 5 per cent. cocaine hydrochloride solution and then washed with sterile salt solution. The cornea is superficially scarified with a sharp-pointed sterile needle, and impregnated with the sediment of a centrifuged culture by means of a platinum loop. Forty-eight hours after inoculation, scrapings are made from the cornea and the smears are fixed and stained in the above-described manner. For the examination of the cornea in sections, the rabbit is killed with ether, the eyeball enucleated *in toto* and fixed in bichloride-alcohol at 37° C. for twenty-four hours. After fixation, the eyes are washed in running water for twenty-four hours, the cornea removed and embedded in the usual way in paraffin. The sections are stained with Giemsa solution or methyl green pyronin, giving the sharpest differentiation of the Guarnieri bodies.

Inoculations were made with the first, fifth, eleventh, fourteenth and twentieth subcultures of unfiltered and the sixth subculture of the filtered virus, corresponding to a constant incubation at 37° C. for twenty-eight, thirty-three, forty-two, forty-four and forty-eight days of the filtered virus of twenty-five days. That a diluted but still potent virus did not cause the typical vaccine keratitis could be excluded. The dilution of the original virus in the fifth subculture would exceed 1 to 40,000, far beyond the

limit where a virulent vaccine would produce typical changes in the cornea. The positive results obtained with the eleventh, fourteenth, and twentieth subcultures are still more conclusive, as they must be due to an active multiplying virus. In every instance, the Guarnieri bodies were found besides the typical micro-organisms as the photomicrographs 12 to 24 demonstrate. How long the virulence of subcultures causing vaccine keratitis can be maintained, remains to be seen.

#### FINAL CONCLUSIONS.

The constant microscopical findings of these micro-organisms in the specific lesions, their peculiar staining properties, the cultivation of a similar organism from the original as well as from the filtered variola vaccine and the production of the typical changes with far distant subcultures from the primary culture in susceptible animals, leave no doubt as to their specific nature of the cultured virus. Concerning the classification of these organisms in the system, it would be premature to make any positive statement at present, as long as we are not sufficiently informed of their biological properties. Von Prowazek designates the filtrable virus as 'chlamydozoæ' on account of their peculiar property to form cell inclusions. Lipschuetz coined the name 'strongyloplasmen,' based on their morphological structure, while the majority of these viruses are roundish protoplasmatic bodies. I proposed the name 'azurophile' or 'thiazinophile' micro-organisms on account of their affinity to certain aniline dyes, belonging to the thiazine group. Are these micro-organisms true bacteria or the missing links between bacteria and protozoa? The azurophilia of their protoplasm would suggest a more close relationship to the protozoa than to the chizomz cetes, if it is justified to make a classification on their staining properties only. Morphologically they resemble bacterial forms. The specific azurophilia which characterizes these organisms during their parasitic growth in the tissue, which is due to an adaptation on certain tissue substrates, is lost as soon as the micro-organisms are cultivated *in vitro*. During their extracellular growth they acquire a panchromatophilia to great numbers of basic aniline dyes with which all other organisms can be made visible. It remains to be seen if the artificial cultures of these micro-organisms are able to produce an active immunity or give rise to antitoxic or bactericidal antibodies as the original viruses adapted to the living tissue.

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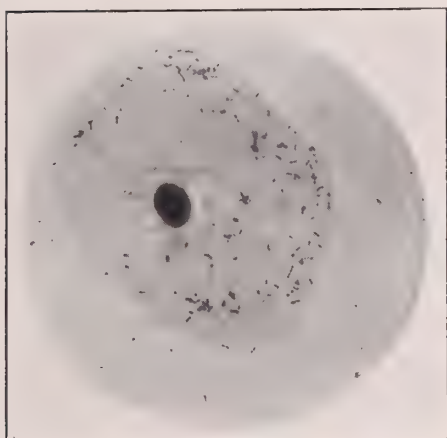


Fig. 1.

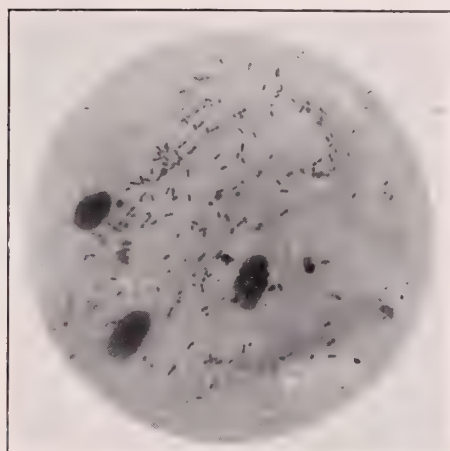


Fig. 2.

Fig. 1.—Smears from pustular contents of variola humana. Epithelial cells filled with micro-organisms, intracellular form. Methyl-alcohol fixation. Methylene azure. Leitz. Ocular 4. Oil immersion 1/12.

Fig. 2.—Smears from pustular contents of variola humana. Epithelial cells filled with micro-organisms, few intranuclear. Methyl-alcohol fixation. Methylene azure. Leitz. Ocular 4. Oil immersion 1/12.

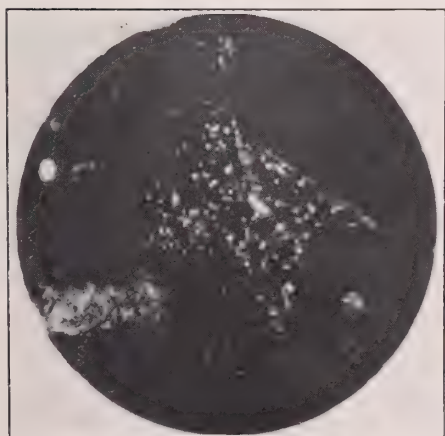


Fig. 3.

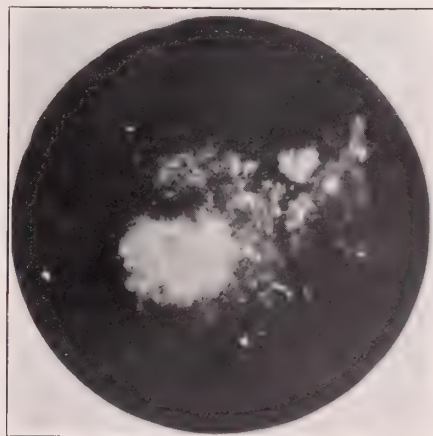


Fig. 4.

Fig. 3.—Variola vaccine, native specimen. Epithelial cells filled with intracellular form of virus. In lower left quadrant an agglomeration of extracellular virus. Dark-field illumination. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 4.—Variola vaccine, native specimen. Extracellular virus. Dark-field illumination. Leitz. Ocular 2. Oil immersion 1/12.

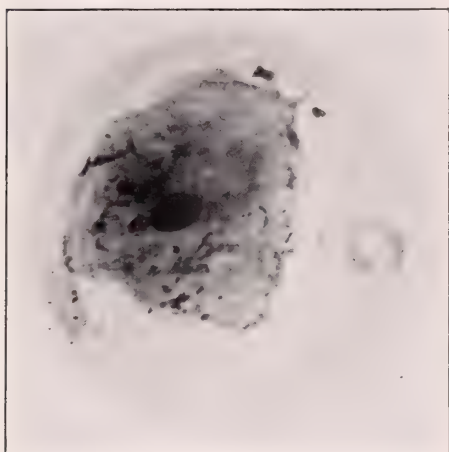


Fig. 5.

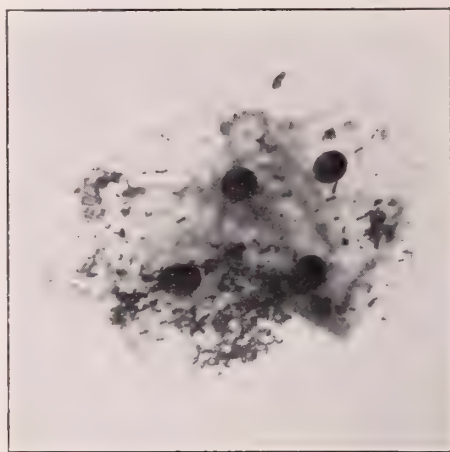


Fig. 6.

Fig. 5.—Variola vaccine. Epithelial cell filled with intracellular virus. Methyl-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 6.—Variola vaccine. Several epithelial cells filled with intracellular virus. Methyl-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

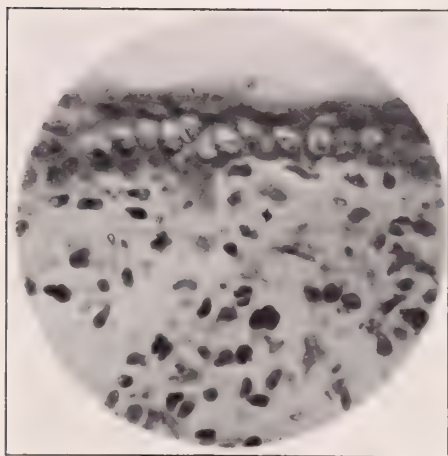


Fig. 7.

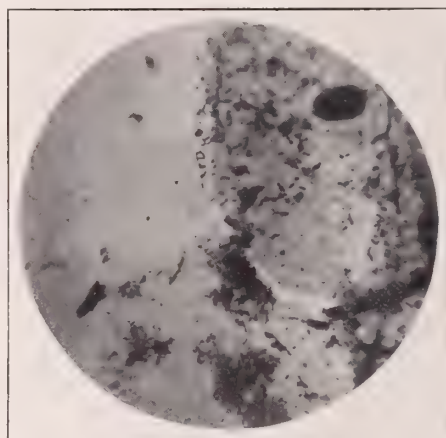


Fig. 8.

Fig. 7.—Vaccine keratitis. Original glycerinated variola-vaccine virus. Section of cornea, showing numerous Guarnieri bodies. Giemsa stain. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 8.—Smear of cornea, inoculated with original glycerinated variola-vaccine virus. Epithelial cell filled with intracellular virus and formation of extracellular virus. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

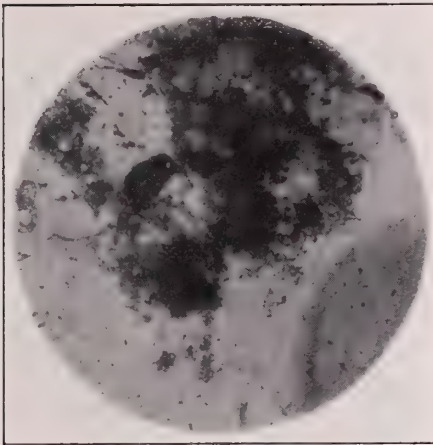


Fig. 9.

Fig. 9.—Smear of cornea, inoculated with original glycerinated variola-vaccine virus. Huge masses of extracellular virus. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

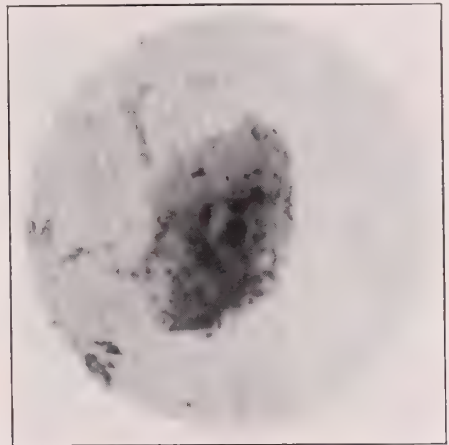


Fig. 10.

Fig. 10.—Smear of cornea, inoculated with original glycerinated variola-vaccine virus. Epithelial cell with several Guarnieri bodies round the nucleus and intracellular form of virus. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

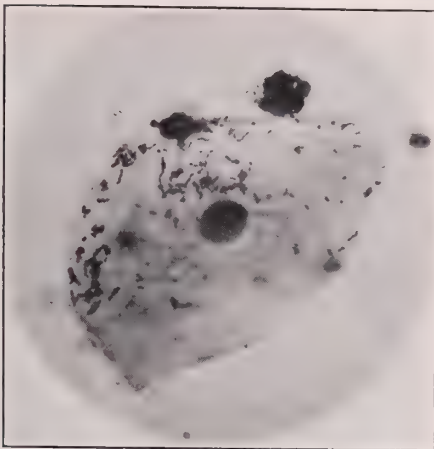


Fig. 11.

Fig. 11.—Smear of cornea, inoculated with original glycerinated variola-vaccine virus. Epithelial cell with many intracellular micro-organisms. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

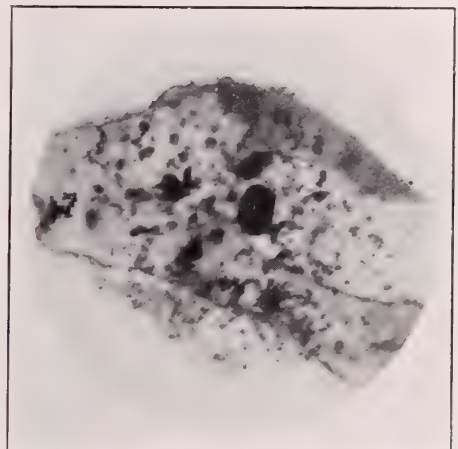


Fig. 12.

Fig. 12.—Smear of cornea, inoculated with fifth subcultures of variola-vaccine virus. Epithelial cell with a few intracellular micro-organisms and several Guarnieri bodies. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.



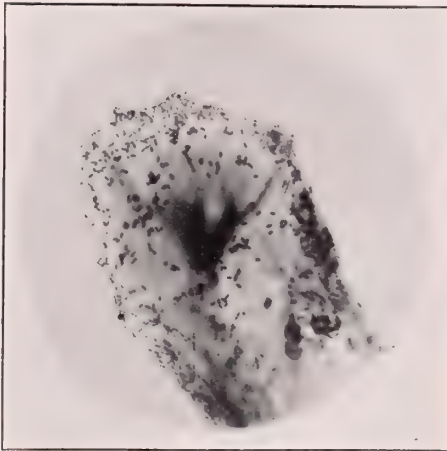


Fig. 13.

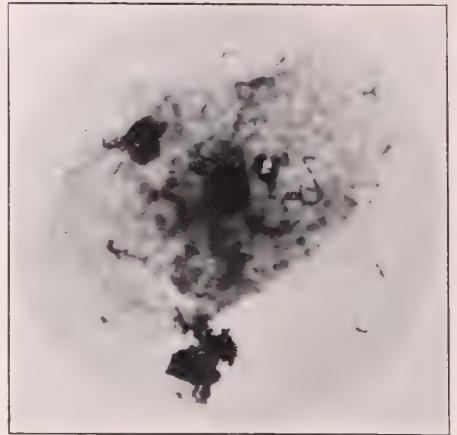


Fig. 14.

Fig. 13.—Smear of cornea, inoculated with fifth subculture of variola-vaccine virus. Epithelial cell with many micro-organisms. Bichloride-alcohol fixation. Methylene azure. Ocular 2. Oil immersion 1/12.

Fig. 14.—Smear of cornea, inoculated with fifth subculture of variola-vaccine virus. Epithelial cell with few micro-organisms and large Guarneri body. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

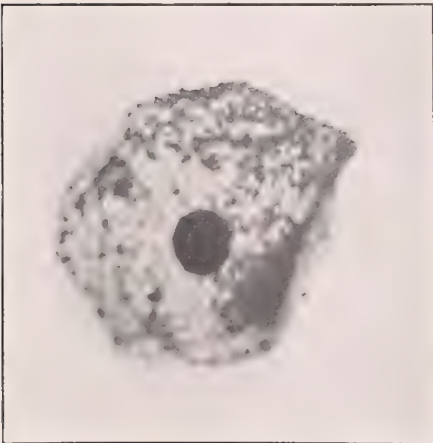


Fig. 15.

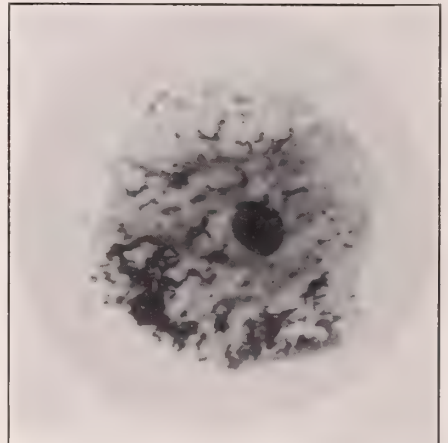


Fig. 16.

Fig. 15.—Smear of cornea, inoculated with fifth subculture of filtered variola-vaccine virus. Epithelial cell with many micro-organisms. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 16.—Smear of cornea, inoculated with eleventh subculture of variola-vaccine virus. Epithelial cell with many micro-organisms. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

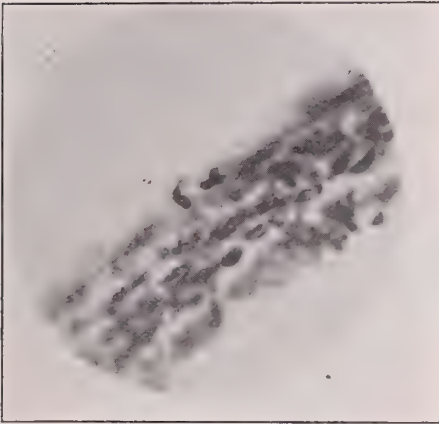


Fig. 17.

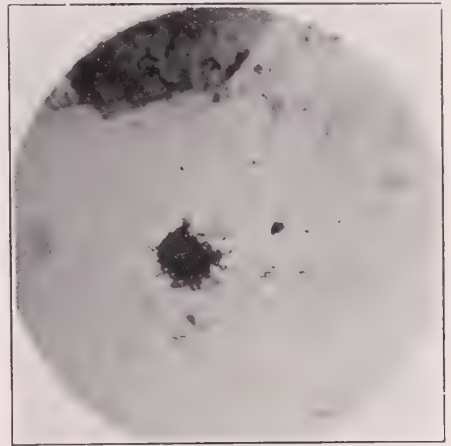


Fig. 18.

Fig. 17.—Vaccine keratitis, eleventh subculture of variola-vaccine virus. Section of cornea, showing two Guarnieri bodies. Bichloride-alcohol fixation. Methylene green pyronin. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 18.—Smear of cornea, inoculated with eleventh subculture of variola-vaccine virus. Showing part of epithelial cell with micro-organisms and an agglomeration of extracellular virus. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

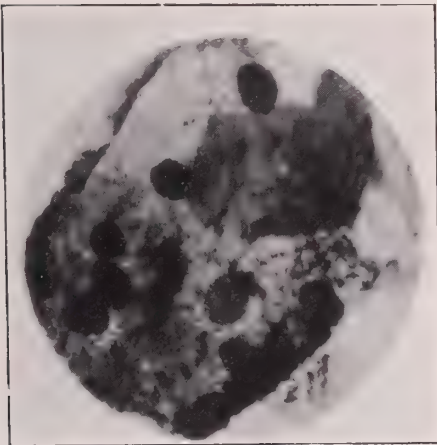


Fig. 19.

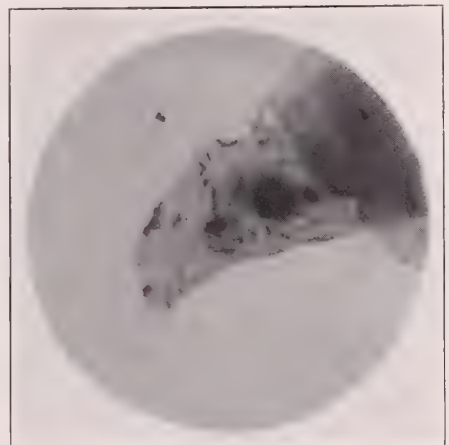


Fig. 20.

Fig. 19.—Smear of cornea, inoculated with fourteenth subculture of variola-vaccine virus. Several epithelial cells filled with micro-organisms. Large Guarnieri bodies in left lower quadrant. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 20.—Smear of cornea, inoculated with fourteenth subculture of variola-vaccine virus. Few micro-organisms with two Guarnieri bodies. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

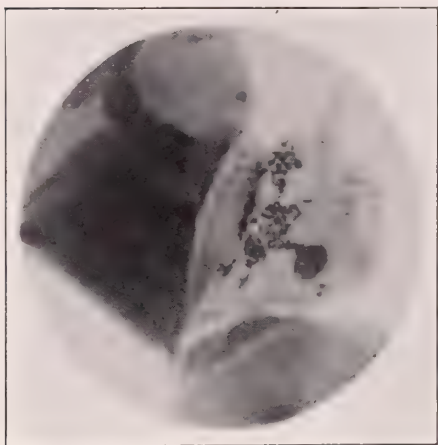


Fig. 21.

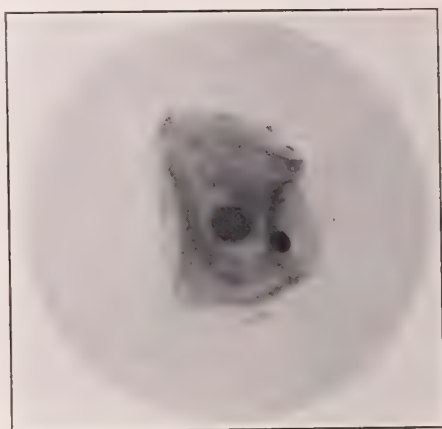


Fig. 22.

Fig. 21.—Smear of cornea, inoculated with fourteenth passage of variola-vaccine virus. Epithelial cell with many micro-organisms. Bichloride-alcohol. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 22.—Smear of cornea, inoculated with twentieth subculture of variola-vaccine virus. Epithelial cell with a single diplococcus (von Prowazek's initial bodies) and a Guarnieri body. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

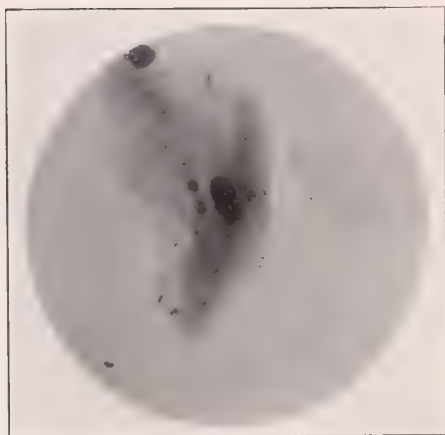


Fig. 23.

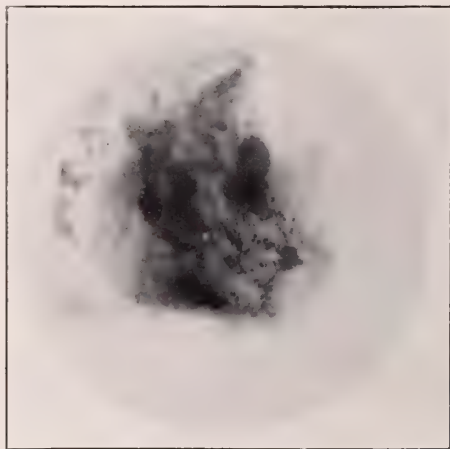


Fig. 24.

Fig. 23.—Smear of cornea inoculated with twentieth subculture of variola-vaccine virus. Epithelial cell with a few micro-organisms and three Guarnieri bodies. Bichloride-alcohol fixation. Methylene azure. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 24.—Smear of cornea, inoculated with twentieth subculture of variola-vaccine virus. Several epithelial cells filled with micro-organisms. Left lower quadrant beginning formation of extracellular virus. Bichloride-alcohol fixation. Leitz. Ocular 2. Oil immersion 1/12.



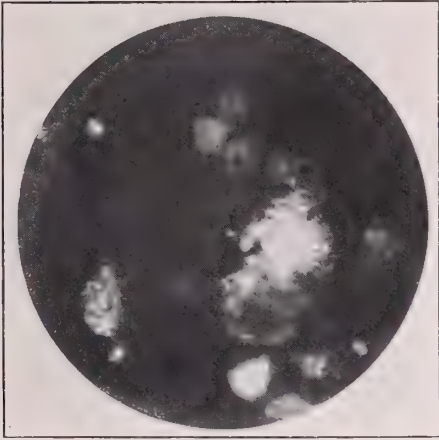


Fig. 25.

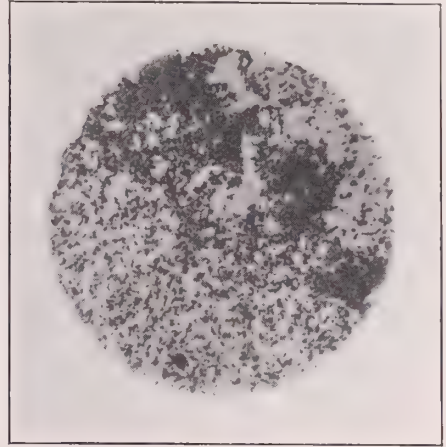


Fig. 26.

Fig. 25.—Native specimen of sixth subculture of filtered variola-vaccine virus. Dark-field illumination. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 26.—Smear of original glycerinated variola-vaccine virus. Loeffler's mordant, concentrated carbolfuchsin. Leitz. Ocular 2. Oil immersion 1/12.

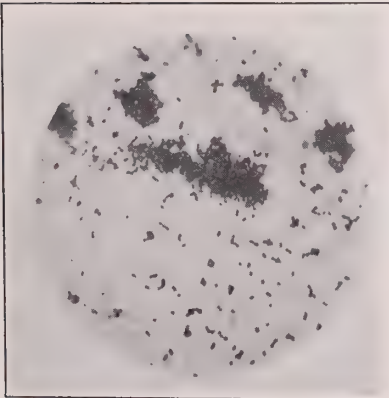


Fig. 27.



Fig. 28.

Fig. 27.—Smear of tenth subculture of variola-vaccine virus. Gram fuchsin. Leitz. Ocular 2. Oil immersion 1/12.

Fig. 28.—Variola-vaccine virus on ascites-maltose agar. Surface colony. Leitz. Ocular 2. Objective 4.

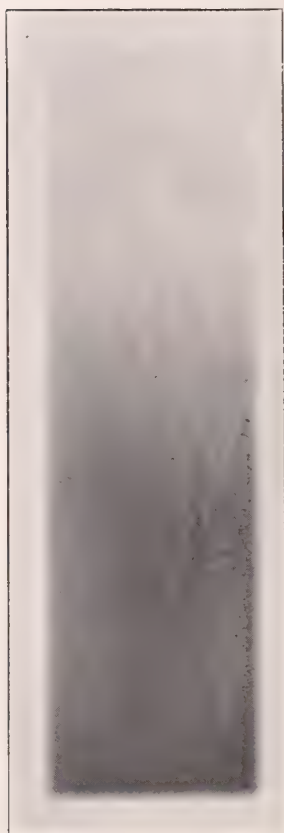


Fig. 29.

Fig. 29.—Variola-vaccine virus. Slant ascites-maltose agar. Surface culture. Low magnification.

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## PYELOGRAPHY: A RATIONAL DIAGNOSTIC PROCEDURE.

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At the 1914 meeting of the American Association of Genito-Urinary Surgeons, the exhaustive discussion which followed the paper read by Keyes and Mohan<sup>1</sup> on pyelography brought out some important facts bearing on this method of diagnosing obscure lesions of the kidney, its pelvis and the ureter. One point in particular upon which everyone seemed unanimously agreed was the fact that to-day too much unnecessary pyelographic work is being done. This statement, coming from so representative a body of urologists, I believe to be the crux of the whole situation as regards the present status of this procedure. Pyelography, in common with so many new advances in medical science, was destined to evolve slowly, passing *en route* through those two extreme phases which attract the clinician, viz., first the over-enthusiastic period, and secondly, the stage of complete antagonism to the method.

When the making of pyelograms first came into vogue, many adopted this method as routine in every case of suspected pathological kidney and many of these cases were handled right in the out-patient clinics, allowing patients to get up and walk home or to proceed to their occupational labors immediately after subjecting them to this ordeal. Needless to state, the vast majority of these 'injections' (and I use this term advisedly) were entirely unnecessary, and were made chiefly for the examiners' amusement, and in many of these 'experiments' the procedure proved not only unwarranted but positively harmful to the patient, at times followed by death. Out of this chaos, in due time, arose a state of affairs reactionary in character to this procedure. Some have gone so far as totally to condemn pyelography as being a procedure accompanied by so much danger and of so little clinical value as to be undeserving of any place in scientific urology. This latter stand, I am pleased to state, is held by a minority of adherents to this special line of work.

Now what is the truth about pyelography? Which opinions are we to accept as criteria of the true value of this diagnostic aid to the clinician? A medial attitude should be adopted. Braasch and Wildner,<sup>2</sup> who have been among the most recent writers to review this subject in an impartial manner, conclude "that unless a pyelo-

gram is made with strict technical precautions, it may cause considerable injury, but that in the hands of those familiar with the technique and with the careful selection of cases, it will prove a comparatively harmless procedure." They further conclude that "the method is too valuable in the diagnosis of many conditions in the urinary tract to be discarded, and finally, an effort should be made to discover a substance which will not injure the kidney under circumstances, and which may be safely employed in the hands of those of limited experience."

I heartily concur with the sentiments expressed by these writers, but believe that there should be incorporated in such conclusions the most important adjunct for success—namely, the *gravity method* of instilling opaque colloidal silver into the organs to be radiographed. Although these writers mention the gravity method in their paper, I do not believe that they lay sufficient stress upon this point. We know to-day that the gravity method is the *only* safe means of obtaining pyelograms, so that it becomes more than a method of election. It becomes the method of compulsion. And yet, with all the warnings that have been sounded from time to time cautioning workers in this field to desist from employing the hand syringe method of 'injecting' (and incidently over-distending) the kidney pelvis, it has come to my attention that only a few weeks ago one of our leading genito-urinary surgeons in one of America's best hospitals had his patient die a few days following pyelography done by the hand syringe method. It was reported that the immediate cause of death was anuria. The European urologists too have been slow to adopt the safer (gravity) method of pyelography, for only recently von Lichtenberg,<sup>3</sup> in an article on this subject describing his technique, makes mention of the fact that he uses a 20 c.cm. record syringe for this work and that when the patient experiences pain in the renal region the 'injection' is interrupted. But then it is usually too late. I believe, and clinical experience bears me out, that in the majority of instances where pain has been produced, infiltration of the collargol into the renal parenchyma has resulted. This termination is certainly to be avoided, and it is logical to believe that the gravity method would obviate this complication. As a fact, in my experience, the complaint of pain, on the part of the patient having a pyelogram made, is exceptional. I believe we can totally eliminate pain in this work if we employ gravity in our instillations.

Gayet and de Beaujeu<sup>4</sup> have contributed an excellent dissertation on this subject in which they laud the gravity method, or as they term it, "allowing the fluid to flow into the renal pelvis under atmospheric pressure." Accordingly they have met with no such complications as have been reported by their colleagues, *viz.*, such complications as pain, fever, nausea, vomiting, renal colic, and, most

serious of all, penetration of the collargol into the kidney parenchyma.

If one will carefully analyze the reports in the literature in which serious permanent injury as well as fatal terminations followed pyelography, the reader will be struck by the large number of these cases in which the hand syringe was used for making the pyelogram. It is safe to say that in the majority of instances the

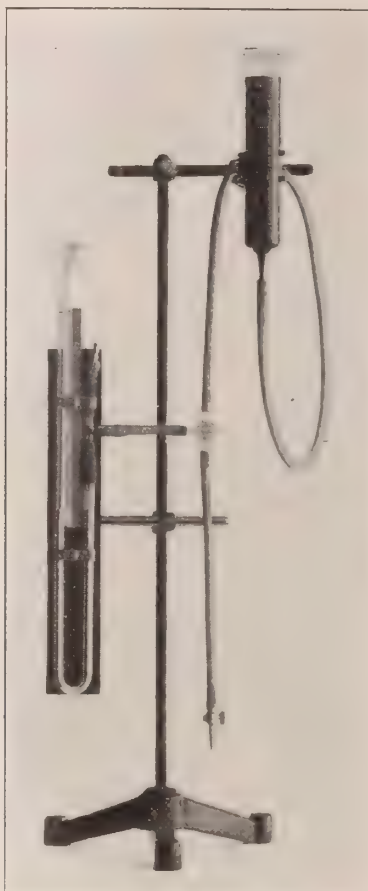


Fig. 1.—Author's gravity apparatus, for making pyelogram of one kidney pelvis and ureter, connected with mercury manometer for registering amount of pressure used in instilling renal pelvis with colloidal silver solution.

amount injected in this manner far exceeded the pelvic capacity. Where the syringe was not employed, the accidents were due to inexperience and lack of judgment on the part of the operator to know the true capacity of the renal pelvis, the strength of the solution to use, the amount of gravity pressure to exercise, the length of time the kidney would tolerate this amount of pressure, and the failure properly to drain the pelvis of the foreign substance after



the pyelogram has been made. Bilateral injections have always given more trouble than where a single organ was studied. Many deaths attributed to this procedure should not be truly classed as such, for, from the array of symptoms these individuals presented, the low functional capacity readings of their kidneys, and the multiple cardiac and pulmonary complications, made them, from the start, poor surgical risks. In one particular class of cases (which the pyelographic maniac claims for his own upon the slightest conjecture)—namely, those with enormously dilated hydronephrotic sacs, where alarming symptoms followed pyelography, the condition *per se* should obviously have contraindicated such an injection, because it is rarely that the diagnosis cannot be made from abdominal palpation of the tumor mass, by cystoscopy and ureteral catheterism, or by a combination of the two procedures.

This brings us to the indications for pyelography. To those who have done any amount of surgery the fact is apparent that occasionally we meet with cases of early hydronephrosis—be it constant or intermittent in type—in which a diagnosis, by the usual means at our command, is ineffectual. Again, in suppurative pyelonephritis, to determine the degree of dilatation and retention, and also for the antiseptic action of the collargol (which is very powerful), this method has its place. In the sundry varieties of renal tumors, which at times tax our diagnostic acumen to the utmost, we have many times wished for something more definite than palpation and ureter catheter reports. In cases of abdominal tumor, difficult to diagnose, to locate the kidney on that side and find out whether the tumor really belongs to the kidney—this is another class of cases where this method is of value. In movable kidney, a pyelogram will often decide whether or no operation is advisable. Radiographic exposures may be made in the reclining and then in the standing position, as first advocated by Fowler, so as to show the degree of excursion of the loose kidney. Then too in anomalous renal and ureteral conditions not recognizable by the usual means of diagnostic procedure, an aid that will put us on the right track is more than welcome. Where calculi are suspected in a kidney pelvis, but in which the ordinary methods of their detection by radiography alone fall short (as is frequently the case where we are dealing with uric acid calculi), the instillation of some collargol solution in such a pelvis around the calculus will often accentuate and clearly define a calculus that might otherwise be overlooked.

In all the above enumerated conditions pyelography will be found of value. Preliminarily, however, to any such procedure contemplated, the patient should be carefully examined to determine his constitutional fitness to undergo such an examination. That is, we should know his blood-pressure; a careful urinalysis should have been made; the reading of a total (two-hour) phenolsulphonephtha-

lein test recorded; and a report obtained on the status of his heart and lungs. Naturally, if any or all of the above examinations or tests do not come up to the required standard, *pyelography is contraindicated*. It should be constantly borne in mind that pyelography is resorted to only in those cases where a diagnosis cannot be made by the usual methods of diagnosis at our command and where an exploratory operation would otherwise seem necessary. Furthermore, I am convinced of the fact that to achieve success, pyelography should be performed with all the care that is given to any surgical operation, and that when so performed, and when applied judiciously, it will be one of the greatest aids to the urological diagnostician.

As an example of useless pyelography, I might cite one type of case frequently met with and where pyelograms are often made. Occasionally we see a patient with a large palpable mass detectable in one or the other upper quadrants of the abdomen in the kidney region, and upon cystoscopy and ureter catheterization, a continuous spurt or flow of urine is seen to come from the catheter going to the affected kidney, and upon aspiration through this catheter several hundred cubic centimeters of clear watery urine is syphoned off. A pyelogram is obviously not needed to make the diagnosis in such a case, and if resorted to we court disaster for our patients.

To Uhle<sup>5</sup> belongs the credit of having first used the gravity method in pyelography. His apparatus consists of a graduated burette which is connected with the ureteral catheter by means of a rubber tubing to which is attached a small cannula. I have recently described a simplified gravity apparatus for making collargol instillations which has given perfect satisfaction.<sup>6</sup> For the purpose of accurately measuring the amount of fluid pressure exerted by gravity in making pyelograms, Tennant<sup>7</sup> recommends that a mercury manometer be interposed between the burette containing the colloidal silver solution and the ureter catheter. This idea has been carried out by me in my work and is shown in the accompanying illustration. The connection is made with a T-shaped glass tube. I have found that for every foot that the burette is elevated (with 10 per cent. collargol or skiargan), the manometer registers 10 mm. of mercury. For all ordinary purposes an elevation of 1 ft. above the body of the patient will give all the pressure necessary for the liquid to flow into the kidney pelvis. It is dangerous to exceed an elevation of 3 ft. (corresponding to 30 mm. Hg.).

The agents that have been most commonly used for making solutions that would be opaque to the x-rays have been collargol,<sup>8</sup> argyrol,<sup>9</sup> cargentos,<sup>7</sup> and silver iodide.<sup>10</sup> As the last mentioned agent, silver iodide (which has been recommended in 5 per cent. emulsion) produces a viscid liquid which does not flow by gravity, but has to be injected with a syringe, it naturally is eliminated from

the list of eligible agents for this work. Argyrol has been used in aqueous suspensions of from 40 to 50 per cent.; cargentos is recommended in from 5 to 50 per cent. strengths; and collargol in 5 to 12 per cent. concentrations. I have obtained excellent results with skiargan, which is a ready-prepared sterile 10 per cent. solution of collargol, supplied in bottles of 25 and 50 c.cm. Skiargan is commendable for this work because of the convenient form in which it is dispensed. To apply the name 'solution' to any of these opaque fluids is a misnomer; they are in reality only suspensions.

The proper technique to employ, in carrying out this method, deserves more than passing notice. It should be done in an institution where the case can be put to bed immediately following the procedure and watched assiduously for untoward symptoms following the instillation of the colloidal silver solution. The technique proper can be divided under two heads: (a) which concerns the preparation of the instruments and apparatus, and (b) which deals with the preparation of the patient.

*Instruments and Apparatus.*—A catheterizing cystoscope and several sets of radiographic ureteral catheters, size 4, 5 and 6 F.,\* are thoroughly sterilized as for any cystoscopy. The pyelography gravity apparatus, described elsewhere in this article, should be thoroughly boiled and the solution to be used, having already been prepared in a sterile manner (in the instance of skiargan it is sterile and ready for use) and placed in a sterile bottle, is then immersed in a vessel of tepid water where it is kept warm until needed. Just before instillation the burette is filled to zero mark with the solution, all air is expelled from rubber tubing, and the apparatus is then ready for use.

*Preparing Patient and Making Pyelogram.*—Assuming that the patient has first been given the advantage of every other diagnostic method of deciding his case, and no conclusions having been reached as to the trouble, and assuming also that the individual in question is physically fit to undergo pyelography, we proceed as follows. For twenty hours previous to examination no food is allowed; a brisk purgative is given twelve hours before time, and several high enemas are given an hour or two before examination. The patient is cystoscoped and ureter of affected kidney catheterized. Unless both kidneys are suspected of diseased processes it is advisable to take only one side. I have been in the habit of using radiographic (lead or bismuth impregnated) catheters for these cases.\*\* The kidney pelvis is now allowed to drain of its contents,

\*The danger of exceeding the pelvic capacity can be avoided largely by using the smaller sized catheters, which allow the excess of collargol to escape by its sides into the bladder.

\*\*At this stage of the procedure some operators are in the habit of removing the cystoscope from the bladder, leaving the ureter catheter *in situ*. This uncalled-for interruption in the proceedings is annoying to the patient and unnecessary to the operator, for the entire manoeuvre of making a pyelogram can be covered in three minutes, and it often takes this long to remove some cystoscopes without pulling out the catheter with it.



either by gravity or by aspirating the pelvic contents with a good syringe. Having emptied the pelvis, the case is then ready for the radiologist. The patient is now transferred to the x-ray room and plates and tube placed in position by radiologist (patient never leaving cystoscopic table). After all is ready for the exposure, the gravity apparatus is connected up with the ureteral catheter and the colloidal silver solution allowed to gravitate into kidney, the burette being elevated 1 ft. above the body of the patient (10 mm. Hg. pressure). The cystoscopist keeps his eye on the meniscus of the fluid in the burette, and as soon as this level becomes stationary it is a sign that the pelvis has filled to its capacity and the solution is turned off. A quick exposure is made, the patient refraining from breathing during exposure. I then withdraw the catheter slowly for about 3 in., allow a little more solution to flow in to fill ureter, and make a second quick exposure so as to get a better outline of the whole ureter. Immediately following this the catheter is reintroduced to the renal pelvis and the solution allowed to drain away. If it is found that the solution comes away slowly or refuses to flow out at all, same is aspirated with a syringe, and it is often remarkable to see, in most cases, the operator recover almost the same amount of fluid that was put into pelvis. This point in the technique I consider of the greatest importance, and it is one upon which sufficient stress has not been laid by past writers. *Get out all the solution you can from kidney pelvis immediately following the pyelography.* It may avoid future trouble, for we believe that momentary distention of the renal pelvis causes but little congestion, but that if a foreign solution be allowed to remain in this viscus, intrapelvic pressure produced by spasmodic contraction may drive the colloidal silver into the parenchyma of the organ and do injury thereto.

In this paper I have purposely refrained from making any mention of the vast amount of experimental work that has been done on the study of kidneys (microscopically) following pyelography. In a forthcoming paper I shall publish my results of extensive experimental investigations along this line.

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MASSAGE, EXERCISES AND BATHS IN THE TREATMENT  
OF AFFECTIONS OF THE HEART; THEIR  
RELATIVE VALUE.

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Harvey, in 1650, narrated the case of "a man who in consequence of an injury or an affront which he could not revenge was so overcome with hatred, spite and passion that he fell into a strange disorder, suffering from extreme compressions and pain in the heart and breast from which he only received some little relief at last when the whole of his chest was pummelled by a strong man as the baker kneads dough."

Physical or external therapeutics in contradistinction to medical or internal remedies, have come much into favor in the treatment of disease of the heart in the past few years. These are massage, resistive movements, saline baths, and mountain-climbing. Of these, massage is the most generally applicable. It can be used in cases so weak as to preclude the possibility of applying any of the others. In almost every conceivable form of weak and diseased heart, the writer has been called upon to do massage, and usually with marked relief and comfort, before Schott or Oertel were ever heard of. While it was being done and for some time after, the patients have generally been able to lie on either side or flat on the back, and often go to sleep in this position, what they could not have done before. In other cases, where it was impossible for them to lie down at all, the writer has *masséed* them with relief until within a short time of their death.

Massage of the chest over the region of the heart has a powerfully tonic and sedative effect on this organ, as either physicians or patients can prove by observing its effects in their own persons by means of Bowle's excellent stethoscope. Even a well but lazy heart will be found to beat much better and with a clearer accentuation after a few minutes of massage, reminding one very much of the effect of using the bellows on a fire that burns slowly. This is most marked in the flabby neurasthenics.

The enthusiasm of Oertel over massage of the heart may have gone a little too far, but perhaps this may have been necessary in order to wake up the profession to its great value. In a recent work on this subject, he considers that massage acts upon the heart in the same way that it does upon the muscles of the extremities.

In order to do this, the chest wall would have to be removed, so that the heart might be grasped and directly *masséed*—a procedure that would hardly be justifiable in the human being, except in extreme cases. While the patient stands, he advises that gliding pressure should be made upon the chest walls downward and inward, the benefits of which, he states, “are not only referable to its influence in perfecting expiration, but also to the direct pressure upon the heart, influencing its nutrition precisely as massage benefits the muscles of the extremities.” The patient would have to be pretty well to stand while this was being done. The influence of massage over the heart is indisputable, but evidently it must be more indirect and sympathetic than direct. Oertel very properly considers this treatment indicated—

“1. When the heart muscle is weak from deficient nutrition, anemia or corpulence.

“2. When the arterial system is imperfectly filled and there is passive congestion as a result of insufficiency of the myocardium.

“3. When there are valvular lesions or obstructions to the circulation, the pressure of tumors, or constriction of the pulmonary orifice, emphysema, or curvature of the spine.

“4. As an accompaniment of treatment of the heart by mountain-climbing.

“It is contraindicated in acute or recurring endocarditis or pericarditis, in acute and subacute myocarditis, the result of sclerosis of the coronary arteries, and in general arteriosclerosis.”

The writer has never seen a case of arteriosclerosis that was harmed in any way by massage, nor has he met anyone who has. Such a statement is made on purely theoretical grounds.

General massage, carefully administered, is of great aid to the peripheral circulation, lessens the work of the heart, tranquilizes the nervous system, and induces sleep in the worst kind of heart disease; and massage of the abdomen often works well as a diuretic and to relieve the stasis of the mesenteric veins and all the other abdominal veins.

Next to massage in its universality of application and under circumstances in which patients have been too weak to undergo saline baths or mountain-climbing, come resisted movements. These, combined with the saline, sparkling waters of Nauheim, were first brought prominently to notice by the Drs. Schott, who up to 1891 had treated in this way 2,700 cases of cardiac disease, mostly with great benefit or recovery. Each resisted movement of extremity or trunk is slowly and completely executed, followed by a pause, after which the opposing movement alternates in the same way, while the physician or person who makes the resistance is ever watchful to avoid anything like fatigue, difficulty of respiration, or increased disturbance of heart, and should such arise a longer pause



is given. Some of the advocates of this method state that no movement is to be repeated twice in succession to the same limb or group of muscles, but the writer has yet to learn that Schott himself is so absolute in his directions.

The immediate effect of the bath is not quite so marked as after the exercises, but it lasts longer while the exercises can be used repeatedly on the same day and without regard to place. In illustration of this the resistive movements were given to a boy who was weak and anemic. Percussion showed dilatation of the heart. Two skiagraphs were taken, one before, the other fifteen minutes after a quarter of an hour of exercises of moderate resistance. It was evident that the heart had contracted strongly on both sides and that it had changed from the shape of an orange to that of a lemon and was one-half inch smaller by measurement. For the sake of comparison and in order to ascertain the effect of the Nauheim effervescent bath alone, Schott had a somewhat similar case, a girl of fourteen years, carried to the bath and after this back to the table. It was found as a result of the bath that the heart had contracted about 1 cm. (less than half an inch) in its horizontal diameter. This is getting matters down pretty fine.

It has also been shown by Schott to the satisfaction of impartial observers that wrestling or bicycling until the breathing became short or excessive produced dilatation of the heart and weakened it, from which he has deduced the axiom: "Systematic exercises strengthen the heart, unsystematic exercises weaken it."\*

Thorne, of London, who has witnessed the effects of systematic resisted movements in many cases, says of them: "The results are such as would scarcely be believed by any but an eye-witness. It is by no means uncommon in cases of dilatation to see within one hour the oblique long diameter of the heart's area of dulness diminished by from three-quarters of an inch to an inch and a quarter; and, perhaps more surprising still, to observe a diminution by as many as two inches in vertical measurement of a liver which at first extended to the umbilical level, and to hear the patient at the conclusion of what cannot be considered an ordeal, volunteer the statement that a load has been removed from the precordium, that he breathes easier and more deeply, and experiences a sense of general relief."

When such good results can be obtained from massage or resistive movements alone, it would seem almost superfluous to burden patients with baths besides other than what may be necessary for cleanliness. Indeed, the advocates of the mineralized baths are not very clear in their ideas as to when the one or the other should be used or when they should be alternated or combined, so that these problems must be left to the discretion of the attending physician,

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\**New York Med. Record*, March 26th, 1898.

who will be guided by the effect upon the patients. Dilatation of the arterioles and reduction of high arterial pressure may be obtained by slow, deep kneading of the muscles of the system at large; while on the other hand, increase of the strength of the systole may be brought about by gentle resistive movements of the limbs and by friction or stroking of the limbs and body towards the heart.

The waters of Nauheim consist largely of a solution of chloride of sodium and chloride of calcium with an abundance of carbonic acid gas, and are of varying degrees of strength. Similar combinations are for sale at the drug-stores which can be dissolved in one's own bathtub; but employed in this way the results are not so favorable as they are at Nauheim, where pleasant scenery, bracing atmosphere, and absence from the cares of home all contribute beneficial influences. The duration of the bath at first should not exceed ten minutes, and the temperature of the water should be about 92 or 93° F. At the commencement, the bath should be omitted every other day, then every third day, next every fourth day. Later, the baths are given oftener and longer, their mineral ingredients are stronger, and the temperature is cooler, down to 88 or 85° F. Though the immediate effect of these sparkling waters conveys the impression of a bath of champagne and induces a sense of exhilaration, yet the first few baths are apt to be associated with a sense of oppression at the precordium and the patients breathe more slowly and deeply for a few minutes. Respiration then becomes easy and continues slower. When infiltration or deposit has occurred in accessible places, careful massage succeeds the bath. Sometimes the resisted movements are used to prepare patients for the baths, and they should be continued sufficiently long after until the patients can climb mountains. After the completion of the bath and exercise treatment Schott says he has seen patients make extensive tours through the Alps and even climb Mont Blanc and Monte Rosa without any difficulty. Nothing is said about the duration of the treatment. It must vary greatly to suit different cases and be limited or extended by the convenience of the patient.

It is certain that but few American patients who are well enough to go to Nauheim would be willing to submit to this treatment at home for a sufficient length of time to do any good at all.

Respiratory exercises are often of great value, even when not enforced by the exhilarating exercise of mountain climbing. John Hunter, in his graphic sketch of his own case, stated his belief that he had often prevented himself from dying by deep breathing. Deep respiration alleviates the suffering of many cases characterized by extreme arterial pressure as well as those attended by cyanosis. It probably acts by unloading the right cavities of the heart and by relieving pressure from the aorta (Gibson).

It is emphatically declared that gymnastics or physical exercises by means of mechanical appliances should form no part of the system of resisted movements, and they are even opposed to it as harmful. They ought to be helpful when improvement has sufficiently progressed, especially exercises with elastic cords, as their use gives alternate resisted movements each way.

Possibly the advocates of the saline bath in disease of the heart have not taken sufficient account of the fact that when a body floats in water it is buoyed up by an elastic resistance equal to its own weight, and this presses the venous blood and lymph back to the heart from the parts that are submerged. This is massage by hydraulic pressure of the immersed portions of the body.

According to Fleischi, the shock of the blood sent into the capillaries at each cardiac systole has a mechanical action in aiding the chemical processes of tissue change in somewhat the same way, though to a less extent, as a blow upon a percussion cap. If a heart is too feeble or the resistance in the vessels too great to allow the blood entering the aorta at each systole to give a distinct, forcible impulse to the blood present in the arteries, the chemical changes in the tissues will be sluggish and imperfect. It is therefore of the utmost importance in the treatment of disease to maintain the action of the heart and to stimulate it when flagging (Lauder Brunton).

Powell, in the *British Medical Journal* of April 9th, 1898, helps to define more clearly the use of massage and exercise. He tells us that massage is a means of helping on the convalescent stage of acute heart disease and of combating the tendency to stagnant circulation in those who are disabled by chronic heart disease. The treatment, he thinks, is still more useful in maintaining the circulation and mildly stimulating the coronary circulation in those who are bedridden and, on that account, suffer from impairment of heart nutrition and chilly extremities, feeble pulse, torpid digestion, and passive congestion of the lungs. The treatment is not advisable in acute affections of the heart.

The effects of the Schott or Nauheim exercises are a stimulation of the heart's action, with a steadying effect or increased completion of the systole, improved circulation through the coronary vessels, and an increased motility of the blood by its readier passage in greater bulk through the muscles, thus relieving stagnation in the great internal organs, especially of their veins. The graduated exercises may be regarded as a counsel of perfection, as a preliminary to the return to this increase of active life of which the condition of their heart admits, and also as a guide to what that measure of exercise will be. Resistive exercises are especially adapted for the initial treatment of those flabby, irritable, 'stuffy' hearts, applying this term to cases of fatty infiltration and impaired metabolism



which are met with in people of venous plethora. Irritation of a sensory nerve causes general contraction of blood-vessels.

In cases of chlorosis with dilated heart, after a preliminary week or two of rest, the Schott treatment is valuable if combined with a dry, bracing air and mild chalybeate. It is useful in commencing failure of the heart, in chronic valvular lesions, combined with less of other exercises, and also after such cases have been restored to a certain extent by digitalis. It is unsuited in all cases of acute endocarditis while there is any trace of activity of lesion left, and in cases of advanced cardiovascular changes of the nature of sclerosis, or in introspective people with neurotic hearts.

An excellent summary of this treatment of heart affections was given by Sir Grainger Stewart before the British Medical Association at Carlisle. He has fully satisfied himself on the following points:—

1. That in the great majority of cases of cardiac dilatation the area of cardiac dulness diminishes perceptibly during each administration of massage.

2. That the character of the cardiac sounds and the rhythm and strength of the pulse correspondingly improve.

3. That although the immediate favorable effects pass off in a few hours, yet they frequently do not pass off completely, for he has often found the line of cardiac dulness within that with which they had started at the previous seances.

4. That the patients usually experience a sensation of comfort and feel the better for the treatment.

5. That repeated applications of massage bring about a permanent diminution of the area of dulness, with improvement of pulse and of the patient's sensations.

6. He has seen a case in which the so-called Schott treatment produced a deleterious effect, rendering the heart more irregular and intermittent. It was afterwards treated by massage alone on the following day with most striking benefit. It turned out that the patient was not sufficiently well to bear the active movements, but was greatly benefited by the passive ones.

7. That on one or two occasions he has seen the manipulations produce unfavorable effects, apparently because the heart was too feeble and the patient was fatigued at the time of application.\* (In this last case it is possible that the massage was too vigorous, or that the manipulator himself was not in good condition. The author one day had to walk three-quarters of a mile in the teeth of a cold wind to give massage to a patient with a weak heart. The result was the only unfavorable one of the kind he had ever had: the patient was unduly fatigued. If he could have ridden to the patient's door, the result most likely would have been different.)

\*Dowse: Mechano-Therapy in the Treatment of Heart Disease. 1898.

Abrams\* finds that any cutaneous stimulant—mechanic, chemic, or electric—will produce diminution of the size of the heart with temporary dilatation of the lungs. Vigorous cutaneous friction by means of a wire brush seemed to afford him results in heart disease nearly as good as those obtained by the more elaborate treatment by means of baths, massage, and exercises. He quotes Moccucci, who sprayed the left half of the abdomen with ether in 12 cases of enlarged spleen with the result of decrease in volume of the spleen in all the cases. In repeating these experiments Abrams noticed a decided diminution of the size of the spleen in all the people he tried it on, irrespective of the fact whether the spleen was enlarged or not. Ether spray over the heart and over the liver caused decrease in size of both these organs. The results were confirmed not only by percussion, but also by sight by means of the fluoroscope.

Mass\*\* has reported 2 cases in which patients apparently dead from chloroform syncope were resuscitated by compression in the region of the heart. In both cases, respiration and radial pulse had entirely stopped and the pupils were dilated. The manipulation of the heart in both cases was carried out for over an hour. Compression over the heart was used one hundred and twenty times a minute, and soon after it was begun the pupils became smaller and the paleness of the face disappeared. Afterwards both patients suffered from mental derangement, difficulty of swallowing and speaking, all of which passed off shortly.

Physiologists have not been idle in their efforts to show how weak and failed hearts may be revived; indeed some good men give them credit for leading the way.

If any more confirmatory testimony of the efficacy of massage for weak hearts were needed, we certainly have it in the experiments of Prus† in which dogs were suffocated and brought back to life by massage of the heart. The supply of air was shut off by clamping an India-rubber tube which connected the tracheotomy cannula with an artificial respiration apparatus. Immediately after the death of the animals some of the rib cartilages in front of the heart were removed, the pericardial sac was incised, and the heart exposed. After it had been ascertained that there was no trace of any contraction of either auricle or ventricle, Prus waited fifteen to sixty minutes before he began his efforts at artificial resuscitation. Then the clamp was removed and artificial resuscitation started. The heart was grasped in the right hand so that the thumb rested on the right ventricle, and the four fingers surrounded the left ventricle. Both ventricles were then compressed with moderate force, the compressions being made to imitate the systolic and dias-

\**Med. News*, January 7th, 1899.

\*\**Berl. klin. Wochenschr.*, 1892, No. 12.

†*New York Med. Record*, November, 1900.

tolic action of the heart. In 31 cases, or 70 per cent., life was restored. In chloroformed dogs under the same conditions, 76 per cent., and in dogs shocked by the electric current, 14 per cent. were brought back to life. An attempt to try massage of the heart was made on the body of an alcoholic who had committed suicide by hanging, but without success, as might have been expected.

Statistics, gleaned from various sources at home and abroad by Keen, show that of 28 cases of apparent death in the human being, during chloroform narcosis, 4 recovered by massage of the heart. But this treatment should not be relied upon alone. Artificial respiration should also be carried on and the patient should receive sufficient oxygen. For the purpose of restoring vasomotor tone, adrenalin should be employed.\*

In the great zeal to collect statistics on this interesting subject, doubtless many of them come from the same sources. Thus Lanermant has collected 25 cases of whom 4 were restored to life.\*\* Maclair and Zezas report 28 cases with 6 successful results.†

Three methods are employed to do massage of the heart:—

1. Incising the anterior wall of the chest so that the hand can grasp the heart.

2. Incising the diaphragm and then passing the hand up from the abdominal cavity.

3. Seizing the heart through the diaphragm without cutting it. In syncope the diaphragm is relaxed enough to render the last method easy. It has given the greatest percentage of recoveries (5 out of 9). It is the least mutilating and the only one that should be employed. Although the number of deaths seems large, it should be remembered that all the cases saved would doubtless have died without the use of this method.

When babies are born, if their respiration and circulation are at fault, they are promptly rubbed and slapped without waiting for a diagnosis and usually with the result of bringing them around all right. So the poet of the future may have a chance to express himself with regard to massage somewhat as follows:—

When this world you enter if you're gasping for breath,  
'Tis the first thing they do to save you from death:  
If too soon you would leave this terrestrial sphere  
'Tis the last thing they do to keep you long here.

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\**Therapeutic Gaz.*, April 15th, 1904.

\*\**Rev. de Chir.*, 1906, No. 3.

†*Ibid.*, 1906, III, 1.



## NON-INDUSTRIAL INJURIES TO THE EYE.

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By HENRY COPLEY GREENE, of Boston,Agent for Conservation of Eyesight, Massachusetts Commission for the Blind.

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Among 2,330 hospital cases of ocular injury and ocular disease treated in three Boston hospitals during two years,\* 352, or 15.1 per cent., were cases of non-industrial injuries and their sequelæ. These injuries were the most common difficulty treated, exceeding in frequency even industrial injuries which came second, with 11.2 per cent. of all cases. These 352 cases of non-industrial injury consumed 4,950 hospital days at a cost of about \$8,683, or 15.2 per cent. of the total hospital cost, and the wage loss to patients (at an average wage of \$1.50 per day) must have been nearly as great. Non-industrial injuries, therefore, are of some importance from the social as well as from the medical point of view.

Our data concerning non-industrial injuries to the eye may be considered in relation to the following half dozen questions. (1) In what proportion and how seriously do they involve single eyes? (2) What is their prevalence, and what are their results, in relation to the patients' sex? (3) How does their frequency and how do their results vary in relation to the patients' age, and to (4) their nationality? (5) What is their result in binocular eye-disablement? (6) And finally how far do they combine with ocular disease and with other injuries to produce partial eye-disablement and practical blindness?

*Monocular Results.*—According to our data 96 per cent. of non-industrial injuries involve only one eye. But the single eye, or the more seriously involved of two eyes, becomes totally blind in 29.5 per cent., practically blind\*\* in 62.9 per cent.,† and incapacitated for highly skilled work†† in 78.3 per cent. of the cases. While non-industrial accidents, then, are almost exclusively a one-eye trouble, we find them outranking all other diseases in their virulence of attack. In the proportion of our total cases of one-eye disablement for which they are responsible, they similarly outrank all other diseases. Total blindness of the worse eye is the typical

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\*For the data cited in this paper acknowledgements are due to the Research Department of the Boston School for Social Workers (Russell Sage Foundation) and to its unpublished record-study of the eye cases treated at the Mass. Charitable Eye and Ear Infirmary, the Boston City Hospital and the Carney Hospital during the years 1908 and 1909.

\*\*Vision less than 20/200 with glasses.

†Cumulative percentages.

††Vision reduced to 20/70 with glasses, or lower.

result (29.5 per cent.), with vision between fingers at 3 ft. and light perception (25.0 per cent.), a close second.

*Sex of Patients.*—With 83.2 per cent. of all cases men and boys, non-industrial injuries, according to our data, outrank all other difficulties, except industrial injuries, in the proportion of male patients. We have no evidence that the sex of the patient directly influences the results of these injuries. We find, to be sure, 23.3 per cent. of recoveries for males to only 12.2 per cent. for females; and 64.7 per cent. practically blind among males to 73.7 per cent. practically blind among females. This preponderance of bad results, however, may possibly depend on women having longer delayed hospital treatment, rather than to any greater liability to bad results from injuries to the eye.

*Age.*—Non-industrial injuries seem to occur but seldom in infancy. They are noticeable, however, between two and four. They reach a high degree of prevalence between five and nine, and their maximum, for the youthful period, between ten and fourteen. After four they are the most prevalent of all eye difficulties. After fourteen they remain at a comparatively low ebb until forty, when there is a visible rise. From fifty to seventy these accidents are again near the high adolescent level. Beyond seventy they reach their maximum.

From our data on non-industrial injuries we may calculate the following percentages of recovery and of practical blindness in relation to the total numbers of cases belonging to different age periods:—

Age Periods.	5-14	15-19	20-29	30-49	50 and over
Total cases.....	77	24	54	100	72
Normal Vision.....	9.1%	8.3%	3.7%	6.0%	4.2%
Vision less than 20/200...	62.3%	54.2%	72.2%	65.0%	73.6%

While these percentages present no marked contrasts between childhood (5-14) and youth (15-19), they show unmistakably that recoveries are less frequent after than before twenty, and less frequent after forty-nine than in the twenty years preceding. They also show that practical blindness of the injured eye results far more often after twenty than before, and that the periods between twenty and thirty and after fifty present the worst results of all.

*Nationality.*—These injuries seem to have a relative frequency of 25.1 per 100,000 of the American, as against 33.7 per 100,000 of

the foreign-born population of Massachusetts.\* They appear to be the one difficulty to which Scandinavians are exceptionally subject. The average nationality rate for non-industrial injuries is 28.4, the highest is 43.5, the lowest 25.1. The rates and their relation to the average are as follow:—

	Scandinavia	Germany	Ireland	Italy	Canada	U. S.	England	Russia
Rate .....	43.5	42.1	38.9	35.4	28.6	25.7	25.1	18.4
Per cent. of average....	1.5	1.5	1.4	1.2	1.0	.9	.9	.6

As for the relation of nationality to results, our data indicate that the results of non-industrial injuries are better among Americans than among either the foreign-born population as a whole, or the Irish or Canadians taken separately.

The following percentages show these contrasts at a glance.

#### RESULTING VISION.

Nationality	Total	Per cent. Normal	Per cent. above 20/70	Per cent. 20/70 or less	Per cent. below 20/200
United States....	198	8.1	20.7	79.3	65.7
Foreign .....	126	7.1	20.6	79.4	65.1
Ireland .....	40	7.5	17.5	82.5	75.0
Canada .....	28	0.	14.8	85.2	63.0

We cannot now determine whether these contrasts indicate racial differences of capacity to recover from ocular injuries, or differences in liability to the severer forms of injuries, or merely greater promptitude among persons of some races in securing proper treatment. Delayed treatment is, however, so obvious a factor in bad results from ocular injuries, that racial tendencies to such neglect may be tentatively accepted as at least a partial explanation.

*Binocular Eye-Disablement.*—Let us now consider what effect non-industrial injuries have on the better eye in the small proportion of cases where both eyes are involved, and what commonly as—

\*These ratios are not rates of prevalence; they are merely ratios of patients, treated in three hospitals, to the population of Greater Boston.

The term Greater Boston as here used, includes Boston, Winthrop, Revere, Chelsea, Everett, Malden, Melrose, Medford, Somerville, Arlington, Cambridge, Watertown, Newton, Brookline, Hyde Park and Quincy.

The population figures are those of the 1910 U. S. Census; the figures for Greater Boston are chosen as a basis of comparison, both because the great bulk of the patients considered in this study live within that district, and because the figures for each group correspond closely enough for Boston, Greater Boston and Massachusetts to prevent any possibility of serious error.



sociated diseases, if any, make them more serious as a cause of industrial disablement.

Among 338 non-industrial injuries, only one caused total blindness; 4 caused practical blindness\* and 7 caused visual disability for the more skilled trades. On this basis they must be ranked relatively low as a cause of visual disablement.

But in reaching a practical conclusion as to the patients in question, we must consider the combined effect of non-industrial injuries and other diseases. The following comparison of the amount of damage done by non-industrial injuries, with the vision of the patient's better eye, will make the distinction vivid.

	20/70 or less	Less than 20/200	0
Vision of injured eye.....	7	4	1
Vision of better eye.....	46	19	1

The explanation is to be found in a variety of causes. The original injury involved both eyes in 8 cases where the vision was reduced as low as 20/70 in the better eye; and sympathetic ophthalmia subsequently attacked the uninjured eye in 4. Other troubles were: old injuries, 4; cataract, 6; corneal ulcer, ulcerative keratitis, iritis, occluded pupil, old trachoma, 1 each; keratitis, 2, and other difficulties unknown.

Among our 2,330 hospital cases, then, non-industrial injuries were responsible for 4 of the 120 cases of practical blindness in the better eye resulting from single causes; but with other contributing causes they were responsible for 19 of the 156 made practically blind by the allied forces of disease. In other words, they caused 3.6 of the cases of the practical blindness resulting from single diseases, while with associated diseases they caused 12.2 of all practical blindness. For cases with vision of 20/70 and less, we find similar results, *i. e.*, 2.1 per cent. of our total due to single causes, and 46 cases, or 9.9 per cent. of our total due to the allied forces of disease.

#### CONCLUSION.

From the foregoing data it appears that non-industrial injuries to the eye are of the first importance, both socially and economically. Outranking those industrial injuries of which we hear so much, they are the most frequent of eye difficulties treated in the three typical hospitals whose records have been considered. Their cost, therefore, is heavy, not only to these institutions, but to the patients themselves. The loss in actual wages is especially great because a very large proportion, 83 per cent., of the patients are men and boys;

\*The figures are cumulative.

and this loss is further emphasized by the fact that the patients are so often young persons whose handicap will continue throughout their working life.

Fortunately these injuries are, as a rule, monocular. Fortunately again, there is some reason to believe that popular education may reduce both their prevalence and the serious results; for, people of native, English speaking or cautious stock (American, English, Canadian and Russian\*) are apparently less often involved than the more impulsive or non-English speaking population (Irish, and Italian, German and Scandinavian). However this may be, any less serious results among American than among foreign patients is doubtless due in great part to prompt and adequate treatment—a fact which suggests that the damage now done may be reduced by a campaign of education among our population both of native and of foreign birth. That such education is of prime importance becomes still more clear when we remember that non-industrial injuries combine with other injuries and with diseases of the eye to produce almost 10 per cent. of our binocular disablement for skilled trades, and more than 10 per cent. of our binocular practical blindness.

As every oculist knows, the causes of these injuries are often as avoidable as they are varied; fireworks, firearms, air rifles, ladies' curling tongs and combs; a child's finger-nail scratching the father's cornea; forks, awls, screwdrivers and scissors dropped from racks, shelves or tables; or a doll's china head broken into the eyes of its tumbling little 'mother.' Of some of these things the use may be limited by law. Of others, the use may be kept more largely in trained hands. Despite legislation and popular instruction, non-industrial injuries will of course occur as long as human beings remain humanly careless and fallible. The menace of such injuries, serious at best, must therefore be reduced by prompt and expert care. In securing such care, not only the physician but the public is concerned. For the public as well as the physician must preach and practise promptitude; and it is the public, in the last analysis, that must make expert care available not merely where it pays, but wherever misfortune makes its undeniable demand.

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\*Practically all Jewish in the locality considered.

ROBERT KNOX AND THE 'RESURRECTIONISTS': A  
CHAPTER IN SCOTTISH ANATOMY.

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By ARTHUR C. JACOBSON, M. D., of Brooklyn, N. Y.

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It was Hallowe'en in Old Edinburgh, in the year 1828. A church-bell tolled midnight and the moon shone down upon the slums of the Cowgate, Canongate, Grassmarket and the West Port. In the fetid alleys the proletarians tenanted in sheds and cellars with rats and vermin. From amidst the filth and horrors emerged the figure of a homeless and friendless woman, compelled to wander the streets under the shadow of Edinburgh Castle, despite the fact that it was a night when witches and devils were 'abroad on their baneful midnight errands.' So she shambled along with an eye to both devils and men—two breeds sometimes indistinguishable.

Also abroad that night in the 'Heart of Midlothian,' capital of 'moral and Christian Scotland,' was a ruffian named Burke, senior member of the firm of Burke and Hare, professional murderers and purveyors of 'perishable goods' to the Edinburgh School of Anatomy. In Tanner's Close, West Port, the ghoul and his victim met. He took her to his house and plied her with whiskey. She sang her favorite ditties, drank deeply, and finally became comatose. Then Hare placed his hands over her nose and mouth, while Burke laid himself across her body. Death quickly ensued. The poor wretch was their sixteenth and last victim. Before her had gone widows, orphans, imbeciles, and other street-walkers. Two lodgers who had seen the body before its removal to Knox's dissecting rooms and sale for £10 gave information to the police, and Burke and his mistress and Hare and his wife were apprehended on the charge of wilful murder.

The horrifying effect of this discovery upon the people of Edinburgh can be imagined, particularly as they had long been wrought up over grave-robbing, a flourishing industry in and around the city. Governmental restrictions upon the anatomists' sources of supply had led to the development of fearful abuses on the part of the 'Resurrectionists,' the grave-robbing class or profession. Burke and Hare had not had the courage to embark on such enterprises, and at first had contented themselves with substituting bags of tanners' bark for the bodies of persons who had died in obscurity, in connivance with undertakers, sextons and other officials. So highly developed was this practice of substitution that even bogus ministers and mourners took part in the obsequies, the managers



posing as relatives and claiming the bodies of those who died in lodging houses without friends. A regular system was in vogue, ramifying among various elements of the population in a manner almost incredible. But it was not long before Burke and Hare tired of this crude and troublesome method. Waiting for casualties was too tedious and precarious, so Hare suggested the new method—namely, to inveigle people into their den and ‘do for them.’ On one occasion the firm took two bodies to Knox’s rooms.

In many cases members of the debased portion of the populace sold the bodies of their own relatives to the anatomists. As a general rule, however, the dissecting establishments procured bodies by exhumation, and in this gruesome activity some of the leading men of the profession were foremost, participating personally in the dangerous industry, and in some instances meeting with bodily harm and even death at the hands of the infuriated people. Among these were reputed to be Liston, Barclay, Monro, Mackenzie, Bell, Ballingall and Cooper. The medical students were, of course, particularly active. Grave-diggers were largely employed. But finally a distinct class of men engaged in the work, and it was these who bore the appellation of ‘Resurrectionists.’ Such was the competition that bodies were stolen by the rival anatomical establishments from each other, and many were the clever stratagems adopted in the strife for the dead.

As has been stated, there were but few legitimate sources. Adequate governmental privileges were withheld. A high standard of proficiency in this fundamental branch of medicine was made imperative upon students of medicine, yet the authorities took no steps whatever to facilitate the acquisition of the knowledge they demanded. Incompetent practitioners were heavily mulcted in damages for deficiencies growing directly out of the odd state of medical education. The student of medicine had to seek expertness by embracing opportunities the detection of which sent him to a felon’s cell. Desperate quarrels arose among the ‘Resurrectionists’ over the spoils and an utterly scandalous state of affairs ensued. The Kirk, the ruling power in Scotland, engrossed since the so-called Reformation with godly discipline, theological feuds, the burning of witches, the hurling of excommunications upon its refractory members, and political intrigues, had given no heed to scientific culture, which was regarded as dangerous to the soul’s welfare and liable to be treated as heresy. This was the institution which had caused minstrels and pipers to cease their vocation, lest they harped ungodly tunes, or ‘endangered men and women by bringing them in too close harmony of person,’ and it was the same institution which had actually hanged two poets and burned countless witches. For the superstitious attitude toward the scientific study of the human frame in Knox’s century the Kirk was mainly responsible. The real

animus toward dissection was born of the notion that the dismemberment of a body was an interference with the plans of Providence and the great Resurrection. Hence the origin of the term 'Resurrectionist.'

While Protestant Scotland shackled anatomy, the great Catholic countries of France and Austria lent every aid to promote the cause of medical science.

Naturally, the first question as to Knox, after the revelations which we have sketched, was, who had his soul in keeping? Under whom did he sit? Whose religious ministry did he attend? Of what congregation was he a communicant? Was he to be found among the 'elect' of his great ancestor's 'Reformed Church'? Now Knox owned to no church affiliations, so the miserable sinner was condemned by the 'unco guid' and his penitence and avowal of errors sought by the smugly charitable. Being outside the pale, the Kirk was at any rate barred from excommunicating him. He was therefore denounced by the clergy, hounded by the press, foully libeled and slandered by professional enemies, and physically attacked in the streets by the mob.

"Down the Close and up the Stair,  
But and ben wi' Burke and Hare.  
Burke's the butcher, Hare's the thief,  
Knox the man that buys the beef"—

sang the ribald crowd. Drunken and savage groups, the lowest rabble of the Old Town, attacked Knox's house in Newington and hung him in effigy. For weeks after the Burke and Hare disclosures Knox was put to it to evade becoming the modern Servetus of a Calvinistic mob. Like Vesalius, he was more than willing to brave every danger in his zeal for the cause of anatomy. His pluck aroused the enthusiastic support of his students, by whom he had always been idolized. He himself was utterly unconscious of having done any wrong. Lord Cockburn, one of the ablest representatives of the Scottish Bar, declared that Knox, tried in reference to the necessary practice of the profession, was the most correct of anatomists. The Procurator-Fiscal of Edinburgh and the Lord-Advocate of Scotland fathomed all the facts of the case most searchingly, but could not show that Knox was in any way accessory to the atrocities. The Dean of his Faculty advised that a committee of eminent advocates, publicists, university professors and physicians be formed for an impartial inquiry. This was done, and after careful investigation the committee reported that not the slightest suspicion attached to Knox, though he was censured because of the laxity of the regulations under which his assistants received bodies into his rooms. It is to be borne in mind that in no instance did the bodies bear any marks by which it could have been known whether

death had been caused by violence or suddenly from natural causes, or from diseases of short duration.

Knox continued his career in the Anatomical School of Edinburgh in an even more brilliant manner than before the West Port tragedy. As a comparative anatomist, anthropologist and naturalist, and as a teacher, he was in the forefront always. His contributions to the Royal Society and to the scientific journals cover an extraordinarily wide range. He was a man of 'magnetic' personality and Mirabeauan force, and as a conversationalist has been likened by his intimates to De Quincey and Coleridge. But he had the defects of genius. He was an egotist and a savage radical. In 1833 he clashed with the University section of the Royal Society. By 1836 animosities had grown to a point where he was made to suffer severely. His best assistants fell away from him and the medical school declined. The University enjoyed a monopoly of privileges and Knox could not break in anywhere, since he lacked the 'Calvinistic credentials.' It must be confessed that Knox's methods of seeking preference were calculated to spoil his chances, aside from his independence in religious matters. In his letters to the Town Council, the Lord Provost and the Patrons of the University, in 1837, when seeking the chair of pathology, and in 1841, when he offered himself for the professorship of physiology, he denounced the educational methods in vogue. He made no bones about declaring the public boards inefficient and indicted every abuse. He attacked fogeyism, coteries and nepotism, and respected no persons in his philippics. What he spoke and wrote was largely truth, of course, but his candid criticism was rank heresy in the Edinburgh of his day. His fierce assaults were not limited to educational and professional matters, but he hit valiantly and poignantly at the religious standards in their stronghold of infallibility. By the ignorant masses, for whom he entertained a truly Horatian contempt, and by the uncultured in the higher ranks of the profession itself, he was denounced as an 'atheist' and 'infidel.' The fifth-rate men elevated to college chairs and engaged in the huckstering of degrees, who were the victims of our medical St. George's cynicism, would gladly have banished or burned him at the stake. One thinks of his sixteenth-century ancestor when reading of his challenge to the buckram and fustian of the nineteenth century. What would Knox say, were he living to-day, of the 'standardization' of our medical schools by the Chinese Mandarins of science?

Knox hung on at Old Surgeons' Hall until 1839, when he joined the Argyle Square Medical School. During this session all the Extramural Lecturers formed the Queen's College of Edinburgh, in order better to compete with the highly privileged University.



The year 1840 found Knox engaged in another feud with his professional fellows, indeed with some of his best friends, for example, John Goodsir, a most amiable gentleman. This grew out of an accusation on the part of John Reid, the physiologist, that Knox had appropriated the findings of Reid with respect to the placental tufts of Weber. As usual, Knox left nothing to be inferred that was capable of interpretation against his enemies. Probably his contentious candor was not mitigated by the fact, confessed by himself, that he was never *water-thirsty*. But then, he was a Scot.

In 1841 he failed in an attempt to secure the anatomy lectureship to the art students of the Scottish Academy. This Scot who refused to be 'canny,' this prince of anatomists, who was all frankness, who refused to be tied down to ancient or modern precedent, to academic lines, or scholastic dogmas, was being gradually frozen out of the 'Gibraltar of propriety.' In November, 1842, he found himself without any class at all and could secure no vacancy in Scotland, but in 1844 he began to lecture at the Portland Street School of Medicine in Glasgow, contending again with an old-established University. But this pious city, home of a fervid Calvinism, was no place for Knox, and his stay was numbered in weeks. No university wanted a man of genius, and now not even a medical school offered him hospitality. The shadow of the West Port tragedy was over his name, too, and he stood at the zenith of his great powers an ostracized citizen. He who had taught anatomy to thousands had lost all caste and was actually without employment. The greatest of teachers had had his Austerlitz, and now had come his Moscow. He left Scotland and sought employment in London while living with an old pupil. He began public lecturing at Newcastle-on-Tyne and Manchester in 1846, on ethnological topics. If one reads his lectures on the "Races of Men" he will find many ethnological data bearing most illuminatingly upon the War of the Nations in 1915 and upon the hollowness of some of our fondest political dreams.

It was characteristic of Knox to speak to the English with the same candor that he had employed with the Scotch. He declaimed against the futility of missions and described what he called the charlatanism of such schemes. Mahometanism, he said, is peaceful, sober and virtuous. Could this be said of the British? If it were desirable to propagate abroad light weights and measures, food adulterations and poisonings, baby-farming, limited liabilities, commercial Quakerisms, social evils, divorce courts, church squabbles and endless modes of deceit, then Christian England, as a perennial fertilizer of such commodities, had a great mission before her. He demolished the popular delusion that the Britisher belonged to a pure race, instead of being a mixture of Taranis-worshippers, Celtic tribes, Romans, Jutes, Angles, Danes and Norse-

men, etc., and taught that in such hybridity dwelt ultimate racial ruin. Worshippers of the democratic ideal in America and sentimental and unwitting fomenters of race hatreds would do well to read and ponder Knox. Of course, being a genius, Knox reveals lines of incongruity, faulty perspective, too-heightened colors, and too great a love of epigram and satire, often at the expense of truth, but the raciness of his style is a joy all too infrequently encountered in the writings of medical men. Knox was not only a great anatomist, and the best teacher of his day, but the chief anthropologist of his epoch and the pioneer of a philosophy "that sought to recognize the true nature of Man, his instincts, his passions, his psychological leanings, and his social and political influences." Statesmen acquainted with this philosophy would be enabled to shape more wisely the destiny of nations, or at least to divine more astutely the inevitable course of human affairs.

Knox insisted that species have not altered since the earliest historic times. The races are perfectly distinct and remain so, when judged in the perspective of long centuries. Every human being brings forth after his own kind, or should do so, and that kind is essentially immutable, if not eternal. The races of to-day are what they were when Man first commenced to engrave on stone what he saw in the external world. Knox refused to sanction the idea of a human hybrid being permanently fruitful or socially worth while. The possible bearing of these ideas of Knox upon the problems of degeneration may easily be divined. The mere fact that some peoples were held together by bayonets and dynasties for a time, as in the case of Austria, did not mean much to Knox's conception of human destiny in the large view. The 'things' that held the American people together interested him from the same point of view. Dire political and racial results will accrue if any of England's Indian troops are permitted to remain in Europe after the close of the present war. Nature is at great pains to preserve her primitive forms of life. What Knox has to say about the Celt, the 'old Pruss,' the Slav and the Saxon throws a strong light on the European war—in which men are foolishly attempting to settle things with the sword which simply cannot be settled that way, but which could be settled if statesmen and people had a very little ethnologic gumption and the former numbered fewer charlatans and demagogues, mouthing democratic 'bunk.' The bearing of hybridity upon warfare in the home, in other words upon the American divorce and desertion epidemic, is something to be considered too. As may be guessed, what Knox has to say about the Jew is highly interesting. The real meaning of the 'Irish difficulty' of England's statesmen, and of the Polish problem, becomes clear at the hands of Knox. He ascribed to hybridity the demoralization of countries like Mexico. The fall of Constantinople

in the present war would add 1,500,000 Turks to the list of nationalities now unhappily crushed under the thumb of the Muscovite Czar. As for the difficulties of England herself, Knox saw clearly that the country's troubles were largely due to a clash between Saxon ideals and the governmental principles for which the hereditary descendants of the Normans—the ruling class—stood. The House of Lords did not square with the Saxon tradition of self-government. He definitely prophesied the solution of the problem. Knox even advised the people on the land question with all the intelligence of a Lloyd George. He also counselled them as to the relation sustained by the Church to the question of poverty—the “Church rampant, Norman, bloated with wealth, corrupt beyond imagination.”

No prudent reticence about Knox. But he was popular as a lecturer. He scared ‘old women of both sexes,’ laid down the abominable principles governing the game of political chess, made startling prophesies, some of which, like the rise of the Italian Kingdom and the dismemberment of the Austrian Empire, came true soon enough to affect his following like the “All hail” of the weird sisters on the blasted heath to Macbeth and Banquo. His originality and audacity were captivating. Upon the minds of his hearers he etched the solutions of things, hidden and esoteric to them, with the acid of his peculiar genius. Human history was not a chapter of accidents—race was everything, and peace prevails in a community consisting of one race only. The natural instinct to preserve racial lines has been well illustrated of late in Belgium, where the results of rapes perpetrated by the German soldiery have been dealt with by physicians with the sanction of the clergy. And it is to be borne in mind that Knox abhorred preconceived Mosaical and Aristotelian notions. His reasonings all proceeded upon the basis of anatomical differences in the races and their patent significances to the mind capable of scientific vision and understanding.

Knox held that a Hottentot could not be converted into a Hollander. Civilization and education may modify, but religious formula is the result of race; morals, actions, feelings, etc., flow from physical structure. Christianity he held to be essentially foreign to the religious genius of the Saxon and Celt, and did not believe that it influenced fundamental racial tendencies very much. In this view he anticipated Nietzsche. For what Coventry Patmore called the ‘machinery’ of the church visible, Knox had a hearty contempt, and as for ecclesiastics, he could no more forbear from taking a crack at them than a ferret could resist worrying a rat. So far as Knox's own religion was concerned, Lonsdale thinks he inclined to Deism. He could not be classed with the Unitarians, says this intimate friend. Sometimes he seemed to Lonsdale to hold by the philosophy of the Greek sage who would have raised an altar ‘to



the Unknown God' upon which good men might consecrate great thoughts—the highest aim in religious worship, and the best security for good works, according to Lonsdale—rather than to the many gods and goddesses but *too well known* at Eleusis and elsewhere.

To the present writer Knox appears to have been quite a thorough pagan, of the sort that Erasmus had in mind when he declared certain ancient worthies better Christians than some of the Saints. Thus he proved in his own person his theory of race; a Scotchman brought up in the most rigid and orthodox way, he nevertheless lived the life natural to his kind. He was a man, not a hypocrite—a glorious pagan unspoiled in the midst of a Calvinistic *milieu*. He was himself and the master of himself, the captain of his own soul, a genuine Scotch Celt.

In London, Knox gave popular lectures on anatomy, using wax models made according to the plan of Dr. Felix Thibert, by whose museum he was employed. Then he sought a Government appointment, in connection with a proposed survey of Africa. Failing in this, he tried unsuccessfully to set on foot a scheme for the establishment of an agricultural college. Next he tried to interest the Government in an extensive scheme of colonization in South Africa, but this also came to nothing. His interest in Africa came about through his five years of military service as a surgeon in that country as a young man. In 1849 appeared Fau's "Anatomy," edited by Knox. His writings on anatomical subjects were very voluminous, now as always. In October, 1853, he gave the introductory lecture to the Royal Free Hospital School of Medicine, alluding in it to the tragic circumstances of his Edinburgh career, but merely for the purpose of showing the gravity of the anatomist's position previous to the year 1830. He failed to secure an appointment in the British Museum and continued to turn out books. He projected a large work on anatomy of encyclopedic proportions, to be published by Messrs. Longman, but there were not enough subscribers to cover the cost. In 1853 Knox wrote that he was "full of life, mad after the discovery of the unknown in science." In this year he wrote a paper for the *Lancet* in which he set forth the relation of certain flies to cholera and coined the term 'cholera fly'—forerunner of our familiar 'typhoid fly.' In his "Contributions to the Philosophy of Zoology" occurs a sentence which suggests Bateson's 'unpacking of an original complex'—"In every embryo of every species we have *the possible* of all forms." At the age of sixty-three he offered himself for the Crimean campaign as a surgeon, but was rejected, so he contented himself with attacks upon the faulty commissariat and upon the hardships and evils to which his professional brethren were exposed. In 1856 he was appointed pathological anatomist to the Cancer Hospital at Brompton.

ton. In 1857 he engaged in translating and editing treatises of various sorts for Baillière, in order to add to his slender resources. He read papers before the Linnean and other societies, chiefly on the Cetacea, on which he was an accredited authority, having spent many of his years in Scotland and elsewhere, and hundreds of pounds, in exhaustive researches on whales. On fish and reptiles he was a noted authority and the author of many classical articles. He was made Honorary Fellow of the Ethnological Society of London in 1860, along with Renan, and curator of its museum in 1862. Next we find him condemning the Sanitary Commissioners—the Board of Health, Commissioners of Works, etc., in “A Plea for the Thames.” In 1861 he was notified by Broca that he had been elected a member of the Anthropological Society of Paris.

A characteristic Knoxism is to be found in his reply to someone who charged that the natives near Glasgow had once been cannibals. “Now,” said Knox, “the story of their cannibalism rests on the very questionable authority of Saint Jerome. I would not have believed the Saint on his oath, nor any other saint.”

Once in showing his old anatomy class how well the skull of the Kafir compared with that of the so-called Anglo-Saxon, Knox said: “Are we to be told that the Kafir is a savage because he lives in the wild, and that John Bull is the happy creature of civilization because he wears breeches, learns catechisms, and does his best to cheat his neighbors—always, of course, on Christian principles!”

Knox’s prolific pen was often driven by the necessities of life, which accounts for the many things which contributed nothing to his scientific reputation. He cared nothing for money, his one serious object in life being the advancement of professional knowledge.

Late in life, Knox was obliged to engage in practice in the Hackney district, and did a large amount of *obstetric work*! He was a popular practitioner, the best of story-tellers, and the most sympathizing of mortals. He literally lived with private friends made in the course of practice. He was good to the poor, sharing his own food with them, and prescribed much gratuitously. In sending money to a nephew in Edinburgh, he wrote: “You cannot think what pleasure I have in making you all comfortable. I do believe that were it not for this pleasure I would not take the trouble to take another meal; for I am tired of the world, its humbug and commonplace.” At medical meetings, when some very poor patient was exhibited, Knox would surreptitiously, as he thought, give him some coins, on one occasion, at least, when he did not know where his next shilling was to come from. He was in the habit of picking up any bread or other food which he found in the street and placing it on a railing, so that some starving beggar might better see it before it was kicked too much about. Then he would lurk around until he saw it disposed of.

Human suffering reduced Knox almost to tears. He loved animals and had a horror of vivisection. He admitted its advantages and endorsed Sir Charles Bell's experiments, but thought there was no justification for the aimless probings and torturings practised by Magendie and his disciples. He detested the French experimental physiologists on this account. It was his humane sensibilities which accounted for his aversion to human oppression. As bearing further on his regard for animals, he always expressed his regret that some effort had not been made to treat a jaguar that died of pleurisy in Edinburgh. One day in the Edinburgh Zoological Gardens he noticed that one of the lions was suffering from an abscess of the paw, and personally re-enacted the rôle of Androcles, relieving the king of beasts with his lancet.

Knox continued to lecture and to write. There was no end to his literary projects, and he died laden down and surrounded with manuscripts on every conceivable subject. The list of his published works is very long. A good deal of this work really usurped the hours that should have been devoted to the extension of biology. In the autumn of 1862 he spoke of writing his life, giving as a reason the conviction that he would be able to prove his entire innocence of all and everything pertaining to the West Port atrocities. He grew more peaceful toward the end and talked with calmness of his contemporaries and even of his enemies. The Prospero spirit took possession of the old warrior, and he desisted from his erstwhile interminable onslaughts upon rivals and those who stole his ideas and appropriated as their own, without credit, his researches, as, for example, his original discovery of the muscular character of the so-called ciliary ligament and the part that it played in accommodation. He attended to his duties at the Cancer Hospital on the ninth of December, 1862, was seized with apoplexy after retiring, and died on the twentieth, aged seventy-one.

The two mistakes of Knox's life which stand out glaringly were, first, an unfortunate marriage contracted in 1824, and his remaining on the ground at Edinburgh so long after he had fallen in public estimation. If he had come to the United States there can be no doubt whatever that his career would have been a most brilliant one. Knox would have been relatively safe in America in so far as religious intolerance was concerned, though we must not forget that our record with respect to other curious matters has not been wholly clean. Boylston was mobbed in Boston because of his propaganda against smallpox, McDowell's life was in jeopardy because of his pioneer work in abdominal surgery, Marion Sims was treated as a charlatan in New York for a time, and in our own day, in Brooklyn, a woman surgeon—Dr. Mary A. Dixon Jones—was destroyed professionally so completely that the very thoroughness and apparent malignity of the job challenges honest doubt as to her alleged faults, the



chief of which appears to have been that she was a woman who dared early to enter and compete in a field preempted by men, many of whom were themselves too radical in their pelvic surgery.

The influence that a clever wife would have exerted over this Titan would have been of incalculable value and would have vitally altered the story which we have told.

The writer has resisted the temptation to deal largely with the sensational aspects of this chapter in Scottish anatomy. The doings of the 'Resurrectionists' would have made good 'copy' but "the real historic interest of the man Knox is centered in himself."

115 Johnson Street.

THE PROBLEM IN SUSPECTED PULMONARY TUBERCULOSIS, AND EARLY CASES WITH SLIGHT LESION AND NEGATIVE SPUTUM, ILLUSTRATED BY THREE TYPICAL CASES.

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The following treatment of this subject applies, almost exclusively, to questions arising in private practice, so the writer has selected illustrative cases from his private office files. He thinks it is quite safe to assert that there is no other problem in the entire field of medicine which is so difficult of solution as this one. The statement that no set rules will suffice applies to many problems and diseases, but in none so aptly as here. Many a practitioner's advice and conduct have been unjustly criticised, and their reputations suffered as a result of honest and intelligent endeavors to perform their full duty in cases of suspected or early pulmonary tuberculosis with negative sputum.

The first stumbling-block which the vast majority of these cases presents is the question of diagnosis. Our literature and experience are crowded with evidence which proves that a staggeringly large percentage of these cases presents a situation that renders a definite, and at the same time honest, diagnosis impossible. Yet, with the growth of the great army of tuberculosis specialists and their concentrated study and effort to detect this disease in its earliest and most controllable stage, there has been spread abroad unwarranted faith in the belief that a definite and true diagnosis, either positive or negative, both can and must be obtained in all cases as soon as the slightest suspicion arises.

It is unquestionably, and naturally, true that those of us who have devoted ourselves to the clinical study of many thousands of cases and suspected cases of tuberculosis are able to detect or exclude the signs of this disease, in many instances, where the practitioner, who sees only twenty or thirty such cases a year, could not. On the other hand, in spite of our special training and the numerous biological, bacteriological, electrical and mechanical aids devised, there remains a considerable percentage of cases in which, even after a week of observation, we can give only a probable diagnosis.

When one presents himself to us for examination, to determine whether or not he has pulmonary tuberculosis, there are five diagnoses, any one of which it is possible for us to pronounce—namely,

*positive, probably positive, uncertain, probably negative or negative.* The writer has several times seen a single case receive all these diagnoses, in the course of a few months, by consulting five specialists.

As will be seen by the first typical case which the writer will cite, the presence or absence of tuberculosis, as well as the position and degree of pulmonary involvement, are points upon which it is often difficult to obtain agreement, even among recognized authorities.

CASE I.—Dr. H., *æt.* thirty-six, married. Habits good; family history negative to tuberculosis; past history as to illnesses, negative. About two weeks before coming to the writer for examination patient began to suffer from gastric indigestion, with epigastric distress and nausea immediately after eating; which persisted in spite of treatment by an enterologist. The night before consulting the writer he began to feel some pain in the lower left side of his chest, which was still present at the time of examination. He had no cough or any expectoration at any time; no dyspnea, no night sweats and no sensation of fever or chill, no loss of appetite, vitality or endurance. The evening before coming to the writer he took his temperature, out of sheer curiosity, and found it was 100.4 F., with a pulse of 96. When he was in my office his temperature was 99° and pulse 82. Physical examination revealed pleuritic frictions, without dullness or change in breath sounds, over the lower third of his left lower lobe. Although the writer searched his entire chest exhaustively for signs of parenchyma involvement, he was unable to elicit any. Patient was of very healthy appearance and normal weight. In the next following twenty-four hours patient submitted himself for examination to no less than three other tuberculosis specialists, all of good standing. All three of these men examined him and pronounced a positive diagnosis of pulmonary tuberculosis, stating to Dr. H. that they elicited positive signs of infiltration of lung tissue, although, they all varied considerably as to the site and extent of the lesions. The only point upon which they were unanimous was that they heard pleuritic friction sounds over the left base.

At the writer's suggestion, patient went to Lake Placid for a few weeks' rest and change. Ten days, or one week, after his departure the writer had a letter from one of the leading tuberculosis specialists of the Adirondack region, to whom he had referred Dr. H., saying that he was unable to find any physical signs in Dr. H.'s chest. Even the friction sounds had disappeared.

Patient may have had an unimportant exacerbation of an old tuberculous lesion. If so, it will almost certainly never give him serious trouble. He will return to the city and to his usual vocation after one month's absence. Now, let us suppose an eventuality which is only barely possible. Suppose, at some future time, Dr. H. should manifest an active and serious pulmonary tuberculosis, from an old lesion, if he has one, or from some future infection; what would the patient, under the tender solicitude of the specialists who said they found signs of active disease throughout his lung on this occasion, think? He would, not unlikely, feel convinced that his health and perhaps his life had been sacrificed by the failure, on the writer's part and on the part of the Adirondack man, to pronounce a diagnosis at this time which would have led to a permanent change in his life to outdoor conditions. He would not be likely to forget, nor would he be allowed to forget, the fact that one of the specialists who examined him did strongly advise him immediately to abandon work which he had been ten years in establishing and go permanently to a life in the mountains.



It is the writer's opinion that, although Dr. H. may have had an exacerbation of an old tuberculous process, it is by no means certain that some other etiological factor was not entirely responsible for his symptoms and pleuritic friction. The writer thinks it would have been a great injustice to have fastened upon him the stigma of active pulmonary tuberculosis on the meagre evidence presented. He also thinks it extremely unlikely that the patient will ever have serious trouble from the same cause, but if, perchance, he should, the writer feels that it is his function, as Dr. H.'s medical adviser, to stand ready to meet whatever censure might arise. Furthermore, he is convinced that overstraining in pronouncing a positive diagnosis in such cases, by many specialists, often arises from a lack of moral courage to face this remote possibility of censure.

CASE II.—A case, which the writer has had longer under observation, is that of Mr. B., who was referred to him by Dr. Harmon Smith, in 1906. He was thirty-four years old, married, and his wife, who was also referred to the writer some time before by Dr. Smith, was suffering from a fairly well-advanced pulmonary tuberculosis. His father's family had a tuberculous history. Mr. B. was a trifle below his usual weight (133 lb.), but of healthy appearance, although very nervous and anxious about his condition. He had suffered from a cough a week or two at a time for several winters, always with some expectoration, but no blood. He had cough and some pain under his sternum when first examined. His temperature and pulse were normal. The writer heard some sibilant râles in both infraclavicular regions, but no dullness or other abnormal physical signs. His sputum was found negative and the writer pronounced a *negative* diagnosis, and gave him explicit directions as to diet, sleeping, rest, work and air, and cautioned him against the possibility of infection from his wife. He then told the writer that a well-known consultant had recently told him that his right upper lobe was tuberculous. Patient has remained at the head of an active business in New York City for the past nine years. He now weighs 144 lb., enjoys good health, and is entirely free from any symptoms or signs of pulmonary disease. Patient is markedly neurasthenic, and the writer feels sure that had he pronounced the case positive his chances of contracting tuberculosis from his wife would have been converted almost into a certainty.

Another stumbling-block arises in these early negative sputum cases, even when the physical signs are so clear that a positive diagnosis is unavoidable. The writer refers to the question of advice and management. We may send the patient to a sanatorium, advise a change of residence—temporary or permanent—under guidance, to one of the many localities renowned for their reputed benefit to pulmonary tuberculosis, or we may advise vacations in the country, under observation, or, in other cases of good physique, where the patient's affairs would render going away disastrous to his material interests; we may advise and direct him in proper living, hygiene and treatment in his home, regulating his work to favor his improvement. There are specialists who take an uncompromising attitude. They would order every case of positive diagnosis to a sanatorium. This, to the writer's mind, is as disastrous as the inexcusably lax policy of trying to treat every case in more or less unchanged home conditions.

The writer has seen failures in all of the alternatives referred to above, and he has seen splendid results in them all. The best results will attend our efforts in this difficult situation when we approach each case from the point of view of the individual affected. Since his sputum is negative, it is his personal welfare which is paramount. We should consider his temperament, his mental attitude, his physical condition, his desires and his circumstances. Our sanatorium reports abound in examples of cases treated by them and their results. The following case, similar to many others in the writer's files, illustrates the possibilities outside the sanatorium.

CASE III.—Mr. T. H. T., *æ*t. twenty-five, unmarried; well thought of by his firm, rapidly rising in his business; his mother and sister dependent upon his earnings. He consulted the writer on August 14th, 1912. Habits, good; no excesses; catches cold easily; digestion good, and bowels regular. One year ago 'caught cold'; has had cough, off and on, since then; rarely has pain in his right side; raises some sputum, which has been blood-stained on several occasions recently. Has some dyspnea on exertion. Has had cough steadily for past two or three weeks, and has lost a few pounds in weight. He has had occasional slight night sweats. He weighed 150 lb. when examined. Physical examination revealed the signs of pleurisy and some infiltration of the right lower lobe, some moist râles in the same area and in his right infraclavicular region, after coughing. His temperature for one week was 95° to 98° F., a. m. and 97° to 99° F., p. m. Sputum, *negative*. Diagnosis, *positive* for pulmonary tuberculosis.

The writer advised this young man to take three months' vacation, which he readily obtained. He was of a cheerful buoyant disposition and very careful in following directions. He went to the northern part of New York state. He secured a large well-windowed room with Southern exposure. The writer gave him explicit directions concerning food, rest, exercise and air, and a letter to a local physician. During the time he was away he gained 28 lb. in weight, all cough and expectoration ceased. He has had several vacations of two weeks to one month duration since that time. He has attended closely to his work in New York and other cities, except during his several brief vacations. He now weighs 170 lb., has no dyspnea, no cough, no pain, no expectoration, no blood, sleeps well, looks well and is happy and contented. A physical examination performed a few weeks ago found his lungs absolutely negative. He is living right and knows that he must continue to do so. This young man's physical signs disappeared gradually during the first fourteen months that he was under the writer's observation. Had the writer insisted upon his going to a sanatorium, it would have been for at least fourteen or fifteen months. He would have forfeited his business connection and brought deprivation upon his mother and sister. He would probably have been somewhat broken in spirit and, though his lungs may have been healed as well as they are now, the local result could not have been better, and, furthermore, he would have acquired a stigma which, unfortunately, so often defies the passage of time.

The writer is convinced that there are some sputum negative cases, of relatively small pulmonary involvement, that it is best to send to a sanatorium. But he thinks they should be sent there only when we have reason to believe that they cannot obtain the requisites for proper treatment elsewhere and when they, for tem-

peramental or other reasons, must have the discipline of an institution.

It is no small hindrance to the average young man's or young woman's welfare and happiness to have spent six to eighteen months, as a patient, in a tuberculosis sanatorium. And, if it is at all possible, the writer tries to give every negative sputum case of slight lesion a chance to recover without this stigma.

245 West 74th Street.



## BELL'S PALSY AND NEURITIS OF THE EIGHTH AND TWELFTH NERVES FOLLOWING SALVARSAN INJECTION.

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for Children, Washington, D. C.

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Foreign observers and syphilographers have reported numerous deaths and very many cases of neuritis following the administration of Ehrlich's synthetical arsenical preparation for the treatment of lues, but such commendable frankness, and conscientious conduct has been not common with us, whatever be the motives. Consequently, the utter abandon with which many practitioners, regardless of their training or special knowledge, proceed to give this powerful mineral poison has not been halted by the fear of evil results, since practically none is laid before them. The wide publicity given salvarsan as a remedy, when it was first given to the profession, and the erroneous interpretation of Ehrlich's claims seem more responsible than any one cause, always saving the lack of investigation on the part of the users. That salvarsan is dangerous and is not a sure cure for syphilis has not long been recognized in this country by the men of our profession who are not in touch with the more populous centres of medical training. Moreover, it has not supplanted mercury in any way. In fact, it seems to be the feeling among all thoughtful users of this remedy that its danger is greatly lessened by a preliminary course of mercury. Certainly, the nerve lesions, such as those with which this paper is concerned, would be materially lessened in number and occurrence. While the case cited here cannot be viewed as an evidence of the Herxheimer reaction, yet the writer thinks that the palsy is an arsenic neuritis and that the pressure palsy is superinduced by the salvarsan being thrown into the blood current in the presence of syphilis hitherto untreated, or prepared, as it were, for the powerful attack of the arsenic. A quotation from the work of Captain H. J. Nichols of the Army, to be given later, however, would seem to destroy the writer's theory, but the difference is not real, though his opinion is not to be lightly brushed aside.

CASE I.—G. R., *æt.* twenty-three, excellent physique, family history negative for tuberculosis, syphilis or any serious organic taint. January 23rd, 1914, consulted the writer for the relief of deafness. Examination showed patulous

Eustachian tube, normal mucosa in nose and throat, tongue slightly atrophic on left half and displaced to that side on attempted protrusion, membrana tympani of left slightly retracted and dull, though of same color and position, practically, as right; left facial paralysis well marked, closing of eyelid not complete; smile unsymmetrical; forehead smooth on left, while rugæ on right. Since his work as locomotive fireman exposed him to heavy, cold drafts while overheated, it was assumed that the case was one of Bell's palsy from cold. The hearing tests were as follow: Conversation, 10 ft.; whisper, 4 ft.; Rinné, positive; Weber, lateralized to affected side; some definite signs of labyrinthine irritation; hearing lowered for low-toned forks, heightened for high-toned; tests not altered by inflation, though he said it seemed to 'clear' his head. This effect, the writer feels, may have been due to temporary restoration of tension in the stapedius, whose innervation was in abeyance. February 3rd, upon insistent questioning, he admitted syphilitic infection two years before, though he stoutly maintained that he had had no symptoms other than a transient rash which lasted only one day, and a small sore which appeared a month after exposure. At this time, without any Wassermann test, he was given salvarsan in full dose, and in two or three weeks, "perhaps ten days," the train of paralytic symptoms appeared. He was given another intravenous injection thirty days after the first, when he thinks the facial palsy improved a little. The writer's first step, in view of the various indefinite statements as to the etiology, was to refer him to the laboratory where luetin and Wassermann tests were done, the first being inconclusive, but the latter a double plus. As the treatment is not of main interest here, the writer will merely say that he was referred to the proper specialist for this. His symptoms have lessened, but the writer personally believes that the pressure exerted upon the seventh nerve was so great in the Fallopiian canal, and so long unrelieved, that a permanent atrophy occurred. As to the neuritis of the eighth and twelfth, they have both been relieved, with corresponding relief in the attending symptoms (lingual hemi-atrophy, labyrinthine symptoms—tinnitus, deafness—deviation of tongue). The seventh nerve is peculiarly unable to resist any pressure or trauma, and lacks the power of restoration after untoward conditions are removed, as seen in the slight injuries attendant on the mastoid operation.

The history given by this patient is so vague as to dates that much must be added or inferred, such as the sequence of the palsy, which he later said might have occurred earlier than two weeks, or even ten days after injection. On this point hangs the writer's belief that this is the result of the tremendous reaction of the salvarsan on the syphilitic deposits in the nerves involved, which would be especially powerful, as he had no mercury to mitigate the severity. However, it is but fair to show that the writer may be wrong; so he quotes Captain Nichols, an admitted authority: "The occurrence of nervous relapses was an unexpected complication of salvarsan therapy in syphilis and for a time threatened seriously to interfere with its progress. . . . They occur in salvarsan treatment only in the early secondary period and only some time after the treatment has been stopped." The writer's case might be considered as being in the early secondary period, but it could not be said that the nervous phenomena, occurring some time after treatment, had been stopped; thus far, accordingly, his supposition

that the salvarsan and not the syphilis was causative seems fairly well supported. "On the other hand," continues Nichols, "if this case be given one or two doses of salvarsan and no other treatment, the bulk of spirochætæ in the body are suddenly destroyed, and the symptoms and Wassermann reaction disappear. All the spirochætæ are not killed, however; some survive, either because they are inaccessible or resistant, and in a short time they begin to multiply, and they meet no resistance such as is afforded by mercury or by the resistance of the body, which has not been stimulated continuously by the parasites. As a consequence, the organisms multiply locally to an enormous extent and produce a sudden, explosive relapse. The effect of the relapse is most evident in the most sensitive tissues, that is, the nervous tissues, and here we see such results as deafness, blindness, paralysis of the face or hemiplegia, or a psychosis."\* So far from disproving the writer's theory, this lucid, reasonable explanation of the true nervous relapse in syphilis rather strengthens it, as it shows that an appreciable interval must elapse after the cessation of the salvarsan in order that the luetic toxin may reassert itself. Certainly a full dose of this remedy would hold it in abeyance for as long as ten days, or even twenty-one; moreover, if it were a Herxheimer reaction, it would occur inside thirty-six hours. Thus, it seems that the nerve affections in this case were due neither to the syphilis itself, nor to the increased reaction known by the name of 'Herxheimer'; consequently, it is fair to assume them to have been the result of an arsenic neuritis, which is one of the long-recognized effects in the use of this drug.

The lesson to be learned from this case, whatever be the conclusion as to etiology, is obvious and valuable: Salvarsan is not to be used without training, without previous mercury treatment or without that eternal vigilance which we have all been admonished to regard as the price of safety.

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\*Nichols: Studies of Syphilis. (Bulletin No. 3, June, 1913, pp. 124-126.)



# MEDICAL AND SURGICAL PROGRESS

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## ORIGIN AND NATURE OF THE NERVOUS SYSTEM IN THE LIGHT OF RECENT RESEARCH.

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### A REVIEW OF RECENT LITERATURE.

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21. Starling: Human Physiology.
22. Spiller: Hemisphericos and Cure of Brain Tumor by Operation. (*Journ. Amer. Med. Assoc.*, Vol. XLIX, p. 2059, 1907.)
23. Yerkes: A Contribution to the Physiology of the Nervous System of the Medusa *Gonionemus Murbachii*. (*Amer. Journ. Phys.*, Vol. VI.)

When the question as to the origin and nature of the nervous system is submitted to a medical student, he naturally thinks of the embryonic stages through which it passes in man and the marvelous complexity of organization in the adult. When the same question is propounded to a vertebrate neurologist, he just as naturally thinks of the general similarity of the morphological origin in all vertebrates, and the form, size, and relation of the adult structure. One of his problems is to homologize the several regions in their finer details of tracts, nuclei of origin, function of the commissures, etc. When this problem is submitted to the biologist he takes a still broader view and one that seeks for the simplest expression of nervous action. Recent researches contribute much both to the problems of medical neurology and to those of general neurology. Several of these researches are published in journals rarely consulted by physicians, which is the reason for some of the longer quotations.

What is the dominant characteristic of the nervous system? The work of man's central nervous system is so varied and complex that it is difficult to grasp easily its fundamental nature. By comparing the central nervous system of numerous varieties of animals it is learned that all can appreciate appropriate stimuli. This power is not a structural element but a physiological property. In the higher animals this condition of being able to appreciate stimuli is confined to a definite tissue—the nervous. If it were not for movement we would have no way of being certain that an animal had appreciated or received the stimulus. Movement in all its varied aspects becomes our indicator in interpreting this fundamental characteristic of the nervous system. The power of receiving a proper stimulus is termed irritability. The nature of the stimulus is not a complete index of the amount of resulting movement; nor does it necessarily predicate the kind of movement. This must mean that the stimulus on its reception into the nerve protoplasm is modified in some way so that the outgoing stimulus is distinct from the original stimulus. Under normal conditions the resulting movement does some specific act for the animal—in short, is purposeful. The result is spoken of as co-ordination. The characteristics involved in co-ordination presuppose three properties, first, irritability; second,

conductivity; third, contractility. While in the higher animals these become specialized in certain definite structures such as sense organs, nerve fibres, and muscles, it is difficult to point out the exact morphological structure which is responsible for each. These three characteristics are rather to be thought of as physiological properties which reach their greatest efficiency, working through these specialized structures. In seeking for what may be designated the biological origin of these properties, animals with a nervous system are too complex; one must study animals without nerves; these are the protozoa.

The protozoa are the simplest animals known to science. In their single cells all of the conditions necessary to life are concentrated. One sees in miniature the life of the higher animal. Because the living protoplasm of this single cell can do so many things it is a little difficult to sort out the fundamental properties which characterize the nervous system of higher animals. If one seeks for some specific structure that is to be responsible for receiving the stimulus, for conducting it to some specific spot, and for the resulting contraction, he will look in vain in the simplest of the protozoa. But when one fixes the attention upon the physiological origin of the nervous system it is possible to learn a great deal from the study of the living single cell. These simple animals have no way of communicating their feelings to us, so that we must fix upon some definite characteristic. Just as in the higher animals, so in this simplest of all living cells, movement becomes the key by means of which we may approach this problem. The peculiar streaming of the protoplasm in the ameba shows how the most primitive of animals moves from place to place. The shape of the ameba changes while the animal is active through the formation of pseudopodia, some of which serve primarily for locomotion, while others act more like feelers. It is easy to see these changes taking place but difficult to determine just what is happening. One of the most accurate descriptions of protoplasmic movement in the ameba is the following by Jennings: "In an advancing ameba, the substance flows forward on the upper surface, rolls over the anterior edge, coming in contact with the substratum; then remains quiet until the body of the ameba has passed over it. It then moves toward the posterior end, and forward again on the upper surface, continuing in rotation as long as the ameba continues to progress. The motion of the upper surface is congruent with that of the endosarc, the two forming a single stream." A great deal of interest centers around the question as to whether the movements of an animal like the ameba can in any way be modified. The following experiment by Mast would seem to indicate that they can, for when an ameba is moving about and enters a brightly illuminated area, in nearly all instances it stops. When one pseudopod comes in contact with the bright light it stops, the ameba does not at once proceed in the opposite direction so as to avoid the light, but sends out other pseudopods at only a slight angle with the first, apparently trying to get around the obstacle in this way. The character of the response does not change after the second and third come in contact with it, but after the fourth becomes exposed, the direction of motion is nearly reversed. This indicates that the reaction is modified, that the response to a given stimulus depends upon preceding experiments.



The second illustration taken from a protozoan slightly more complex than the ameba will serve to illustrate an additional factor in this problem. Stentor is a protozoan which lives attached. When a quiet, extended Stentor is stimulated by lightly touching it with a glass rod it reacts by contracting. After repeating the process a number of times the Stentor no longer contracts, and when it does not it is an illustration of what Jennings means by different physiological states of the protoplasm: "By physiological states is meant the varying internal physiological conditions of the organism, as distinguished from permanent anatomical conditions. Such different internal physiological conditions are not directly perceptible to the observer but can be inferred from its results in the behavior of the animal."

In order that the protoplasm of the organism may produce movement, a number of elementary properties must work together. These elementary or fundamental properties of protoplasm are irritability, which is the property of protoplasm which enables it to respond to a stimulus; conductivity, by means of which the effect of the external stimulus is communicated to all parts of the cell; as these two properties respond, the protoplasm contracts, which is the third property, contractility. These three are bound up in such a way that the animal is able to move in a definite direction; in other words, to correlate its response to a definite stimulus. To quote Jennings: "The reactions produced in unicellular organisms by stimuli are not direct physical or chemical effects of the agents acting upon them, but are indirect reactions, produced through the release of certain forces already present in the organism. In this respect the reactions are comparable with those of higher animals. In the protozoa, as in the metazoa, the structure of the organism plays a large part in determining the nature of the behavior." In addition to the above fundamental protoplasmic properties, there is also in the protozoa one known as spontaneity or the power of an animal to originate movements within itself. "Spontaneous action, that is, activity and change in activity induced without external stimulation, takes place in the protozoa as in the metazoa. Both hydra and vorticella spontaneously contract at rather regular intervals even when the external conditions remain uniform."—Jennings.

In the animals which have different structures through which these fundamental physiological properties act there are three distinct parts: (1) The cell which receives the stimulus, and is known as the receptor; (2) the part of the nervous system which receives and passes on the stimulus, called the adjustor; (3) the nerve fibre passing to the muscles causing muscular contraction which results in movement, and this is called the effector. The simple manner in which these three parts are arranged is illustrated in Fig. 1. The sensory cell body with its sensory nerve fibre is the receptor. When the sensory nerve fibre reaches the nerve ganglion it breaks up into fine branches which are physiologically continuous with similar branches from the nerve cell which has its cell body located in the ganglion. This latter cell body is the motor cell. From the motor cell a long nerve fibre passes from the ganglion to end in the muscles of the body wall. It is difficult, even in this simple illustration to mark off the structural limits of the receptor, adjustor and effector. These three parts acting in harmony constitute a reflex and the re-

flex is a physiological unit which has its simplest expression in protozoa.

Parker in a series of articles on the origin of the nervous system presents a new point of view in the following: "A receptor or sense organ alone would be of no service whatever to an animal; it would resemble a telephone receiver disconnected from the rest of the system. In a similar way the adjustor or central organ is useless without at least some other element in the reflex apparatus. The only mechanism sufficient in itself is the effector, which, if it can be brought into action by direct stimulation, may accomplish something serviceable to the animal.

"In search for the earliest traces of the neuromuscular mechanism, we may turn first to those very primitive metazoans, the sponges. The body of one of the simpler sponges is a more or less goblet-shaped, multicellular mass, whose surface is covered with an enormous number of minute pores; these lead into tubes which in turn communicate with a relatively large central cavity that opens to the exterior by an aperture of considerable size, the osculum. Al-

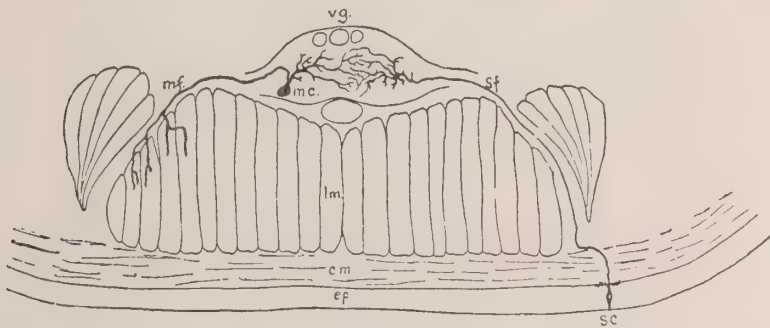


Fig. 1.—Transverse section of the ventral nervous chain and surrounding structures of an earthworm (modified from Retzius). *cm*, circular muscle; *ep*, epidermis; *lm*, longitudinal muscle; *mc*, motor cell-body; *mf*, motor nerve-fibre; *sc*, sensory cell-body; *sf*, sensory nerve-fibre; *vg*, ventral ganglion (Parker).

though frequent efforts have been made to show that nervous structures occur in sponges, nothing of this nature has been conclusively demonstrated and it is now generally believed that these animals are without differentiated nervous organs, either sensory or central. Nevertheless, sponges are capable of a certain amount of response. Merejkowsky (1878) observed that when he pricked with a needle the inner face of the osculum of *Rinalda*, this aperture quickly closed, not to open again for several minutes. This same reaction occurs with the lateral pores of many sponges.

"When search is made for the organs concerned with the closing of the pores and oscula, they are found to consist of rings of elongated contractile cells or myocytes, which surround these apertures. These rings of cells form veritable sphincters and their action is often efficient enough to bring about a complete temporary closure of the aperture. Whether the pores and oscula open by the counter-action of the radial, contractile myocytes or by the simple elasticity of the surrounding tissue does not seem to have been determined.

"Since these sphincters lie very close to the epithelium that bounds the surface of the pores or oscula and in fact probably often form a part of this very epithelium, and since no nervous mechanism is known to be connected with them, it seems very probable that they are brought into action by direct stimulation and that the sponge is a metazoan in which there are functional effectors unassociated with receptors or adjustors. Thus the sponge would represent the first stage in the differentiation of a neuromuscular mechanism, *i. e.*, one in which the effector in the form of a primitive muscle-cell is the only element present. In my opinion it is around these contractile cells that the nervous organs of the higher metazoans have developed and I therefore believe that these effector elements are the most primitive members of the typical neuromuscular mechanism."

A group of animals which have a slightly more complex organization than the sponges are the hydroids and jelly fishes. A study of one of the jelly fishes, *Gonionemus*, has brought out some interesting facts in regard to this primitive condition of the nervous response. This is a medusa with four radial canals from which gonads are suspended. The tentacles vary in number from 30 to 80. The manubrium is a short stalk hanging from the under surface. Yerkes says: "An experimental study of the reactions of *Gonionemus* to chemical stimuli was begun by observation of the manner in which normal animals react to fish-meat. A small piece of fresh fish placed upon the tentacles causes a reaction which usually presents five fairly well-marked phases: (1) Those tentacles that have been touched by the meat contract, twisting about one another in such a fashion as to hold the food and carry it along with them; (2) the group of contracting tentacles bend in toward the mouth; (3) that portion of the margin of the bell bearing the contracting tentacles contracts, thus drawing the tentacles nearer to the manubrium; (4) the manubrium bends over toward the side from which the food is brought, until finally the lips touch the food; and (5) the meat adhering to the lips is slowly surrounded by the manubrium."

"The tentacles of normal *Gonionemata* react to nearly all stimuli by a contraction which simply shortens the organs, but to some foods and to motile touch stimuli they frequently react by twisting into the form of a corkscrew in contracting. It may now be asked, are these reactions of the tentacles dependent upon the central nervous system? This question finds its answer in the results of experiments upon isolated tentacles. Tentacles were cut from the bell about a millimetre from their attachment and placed in Stentor dishes containing sea water. For a few minutes after excision they usually remained in a contracted condition; then expanded and became very active and sensitive to stimuli. Gelatin or meat applied to them called forth the corkscrew reaction. To other stimuli they respond with the usual straight contraction. It is, therefore, evident that the tentacle contains within itself the mechanism necessary for these reactions, and is not dependent upon the functional activity of the entire organism, nor upon the central nervous system for its ability to execute them."

In these two illustrations we have a very primitive condition of organization which we may say is really a simple sensory-motor reaction, and this is probably the most primitive structural or-



ganization of the nervous system. In the jelly fishes definite nerve cells can be found and these are arranged in the form of a nervous net which will transmit, apparently, in any direction—a strong contrast to the conditions of the central nervous organs in all of the higher animals, where the nerve impulse travels in only one direction. In the surface epithelium of such simple animals as hydra there are found a number of cells which have become specialized as sense cells. The inner end of these cells branches into a T-shape. The free end of this special cell acts like a receptor, while the basal portion may contract and thus act like an effector. The term neuromuscular was early given to these cells by Kleinenberg.

Passing from the simple conditions illustrated in the sponges and hydroids to such animals as the earthworm and crabs, a noticeable differentiation has taken place. The diffused net of nerve cells has become concentrated into a regular series of nerve ganglia. These ganglia are arranged in a definite manner and have a specific arrangement of the primitive motor and sensory cells (Fig. 1). Just as soon as these primitive nerve cells become grouped into ganglia there arises a need for intercommunication. In order, then, that adjacent ganglia may be in connection, association nerve fibres develop. Association nerve cells have longer or shorter processes that connect parts within the same ganglion or run from one ganglion to another. Their fibres do not extend into the nerve, but are strictly limited to the ganglia. In the earthworm there are a very limited number of these association nerve cells. Passing from the worm type to the crab type there is found to be a greater number of long neurones in the latter. Parker says: "In the crab, as demonstrated by Bethe, many of the primary sensory neurones extend over half the length of the ventral cord instead of being limited to a few segments as in the earthworm, and the same is true of the primary motor neurones. Moreover, the association neurones have shown an extensive growth. Although in the crab there are some neurones limited to one or two segments as is the rule in the earthworm, the great majority extend over many segments and even through the whole length of the nervous system. In this way the central nervous organs of this animal are locked together much more closely than are those in the worm, and exhibit consequently in their physiology a unity that the worms do not possess. This nervous unity, moreover, has developed to such a degree in the higher arthropods that we may with reason ascribe to such animals as the insects, a primitive form of intellectual life, not unlike that found in the vertebrates."

The central nervous system of vertebrates is built upon a common plan in which there is found the primitive sensory and motor reflex arrangement, closely resembling the conditions in the invertebrates. In Fig. 2, the relations of the primary neurones of the vertebrate are shown. This figure is drawn from a cross section of the spinal cord of the frog. The motor cell-body lies within the gray substance, and leaves the cord at a definite place. The cell-body of the sensory neuron is found in the dorsal ganglion, located on the dorsal root. The sensory cell-body seems to have migrated from the integument to take up its place in this ganglion. This is the condition which obtains in the spinal nerves which represent the more primitive and less specialized portion of the vertebrate nervous system. Parker tersely contrasts the two important fea-

tures in which the central nervous system of vertebrates differs from the conditions of invertebrates: "In the first place, the central organs of vertebrates exhibit a large preponderance of long neurones over short ones, and in the second place, they show an enormous increase in the number of association neurones. In the earthworm there are only three long neurones and the rest are short ones; in a crab the long and short neurones are perhaps about equally abundant; but in a vertebrate the long neurones certainly far outnumber the short ones. In any transverse section of the spinal cord of one of the higher animals almost all of the white substance is made up of systems of long neurones. In this respect the condition in the vertebrates seems to be almost the reverse of that in worms, and in consequence transection of their central nervous organs results in a profound and extensive degeneration such as is never met with in animals like worms. For this reason the central

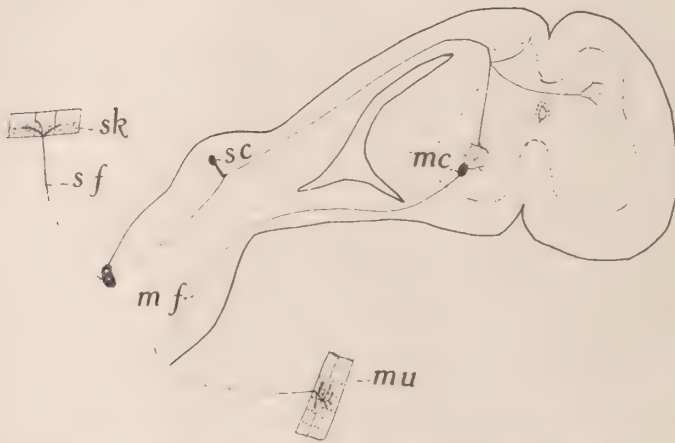


Fig. 2.—Cross section of the spinal cord of *Rana pipiens* showing the dorsal and ventral roots on one side. *mc*, motor cell in the gray substance of spinal cord; *mf*, motor fibre leaving the spinal cord through the ventral and motor root of the spinal nerve; *mu*, muscle; *sc*, sensory cell in dorsal ganglion; *sf*, sensory nerve fibre; *sk*, skin.

nervous system of the vertebrate, though giving much evidence of segmentation in its early stages of growth, is finally a physiological unit such as is realized in no other group of animals, a condition well evidenced by the fact that some of its most recent phylogenetic acquisitions, like the pyramidal tracts of the mammals, may consist of neurones that reach almost from one end of the system to the other.

"The second feature that distinguishes the central nervous organs of vertebrates from those of invertebrates is the enormous development of association neurones. These neurones are present in worms, are numerous in arthropods, but are overwhelmingly abundant in vertebrates. Of the white substance seen in the transverse section of the spinal cord almost all except the dorsal columns represent association neurones. Judged from this standpoint, there are certainly many more association neurones in the cord than all

other kinds taken together. But the association neurones are not only the most numerous in the vertebrates; they also constitute the basis of the most significant evolution."

The central nervous system of vertebrates consists of a number of nerve centres which have lost their segmental character and act in relation with each other. The relation which these many nerve centres bear to one another is excellently phrased by Harris in the following: "The doctrine of centres affirms that there is specialization throughout the nervous system, that certain cells and these alone are concerned with the performance of a particular function, that if that group be destroyed some particular activity becomes impossible. If this functional specialization did not exist, then any one cell-group in the central nervous system could act vicariously for another, but this does not happen. The respiratory centre cannot act for the sweating centre, nor either for the vomiting centre. Just as a gland is not a muscle and cannot do a muscle's work, so the centre for salivation is not that for the flow of tears and cannot do its work. There is, in fact, higher specialization in the nervous system than elsewhere. One neural region governs the muscles of breathing, another the diameter of arteries, another the glands of perspiration, another those of gastric juice, another the act of vomiting, while others still are the place of the uprising of emotions, volitions, speech or memory. Under existing physiological conditions, the centre for smell, for instance, cannot act vicariously for the centre for touch, the speech centre cannot take on the duties of the writing centre, the functional capabilities of the centres are as strictly limited as they are highly specialized. The central nervous system is not a neural chaos in which the units are unrelated or equivalent existences, but it is a cosmos in which the functional units are differently endowed and are related to each other after the manner of a hierarchy, the centres being arranged on several functional planes. Centres are co-ordinated by being subordinated some to others. There is no equality of functional position, there is no equality of capabilities. The nervous system knows no such thing as socialism, if by that is meant equality of position and powers. But in the nervous system there is a neural society in which there are aristocrats who rule and give orders, and servants who serve and obey. Higher centres control but do not domineer over lower. The doctrine of a neural hierarchy is one of the most luminous in modern neurology. For we cannot agree with certain writers who hold that the doctrine of centres is a personification and an unwarrantable metaphor, a piece of neurological anthropomorphism."

In order that these several centres may act together, each carrying on its part, there must be many intercommunicating paths. The primitive sensory-motor reflex has been extended in the ascending and descending branch of the sensory axon in the spinal cord, in fact the dorsal columns of the cord are made up almost exclusively of such fibres. The dorsal columns are known as the columns of Goll and Burdach, and are the only primary tracts extending the length of the cord. Collaterals bearing these same sensory axons, in addition to the anterior and posterior already mentioned, are constantly passing into the gray matter to end in arborizations. The gray substance of the cord thus serves as a continuous nucleus for the termination of these fibres. After entering the gray matter



the fibres are distributed first to the dorsal and middle regions of the gray matter; second to the dorsal nucleus, or better known as Clark's nucleus; third to the gray matter of the ventral horn where they end around the motor cells; fourth passing through the posterior commissure they enter the gray matter of the opposite side.

The rest of the white area of the cord is occupied by fibres which help make a more perfect intercommunicating system. The most of these are known as association fibres, and are grouped into ascending and descending fibre tracts of the cord. The spinal cord is made up of inferior nerve centres, centres that are like the private soldiers in the army, not a highly disciplined army, for they respond to simple reflexes without orders, but nevertheless they belong to an army, for they receive their orders from higher centres when important responses are to be made. So far as most of the vertebrates are concerned there is no direct communication between the cerebrum proper and these lower nerve centres of the spinal cord. In all the vertebrates, there are important descending fibre paths which arise in the cerebellum, the fibres of which pass into the medulla where they are probably relayed through Dieter's nucleus into the spinal cord. In the lower animals there are a group of cells in the roof of the midbrain which also gives rise to fibre tracts that extend into the medulla and spinal cord and which Johnston describes as follows: "On the side of the medulla the fibres give collaterals inward and themselves turn inward to come into relation directly or indirectly with the cells which give origin to the motor nerves. A part of the tract, when it passes over the lateral face of the medulla, instead of going backward along the same side of the brain, crosses to the opposite side through the ventral wall of the medulla, helping to form the large ventral commissure of this region of the brain. The fibres then join the tract on the opposite side and continue with it to similar endings." This tract is present in all vertebrates and serves to correlate in the lower forms the cutaneous and gustatory sensory reactions. It is, therefore, a fundamental vertebrate tract and ends in the motor cells of the medulla and ventral horn.

During the past few years, neurological researches have brought to light many interesting facts in regard to the origin and development of the nervous system of vertebrates. They have emphasized the fact that the spinal cord with its various primary and secondary tracts is essentially similar in all groups of vertebrates except the mammals. In the mammals there is added, as already suggested, a descending tract, known as the pyramidal. The phylogenetic origin of this tract is unknown. It arises from the whole motor area of the cerebrum and its fibres descend through the pons, the medulla, to end finally in the motor cells of the spinal cord. The medulla, the basal stem of the cerebellar region, the optic region, and the basal portion of the forebrain are also practically identical in all groups of vertebrates. The essential difference between the mammals and the rest of the vertebrates consists in the development of the roof of the forebrain. In the lower fishes it is a simple epithelial structure without any marked indications that it is ever to develop into the cerebrum of mammals. Herrick has been studying the evolution of the cerebral association centres of the brain for many years and the following is probably the latest contribution upon this important subject. He says: "It has been

my task for many years past to study the evolutionary history and primeval sources of these correlation centres as they are found in the lower animals. It is found that this tissue is present in all lower vertebrates and that its amount is directly proportional to the intellectual capacities and docility of the animals exhibiting it. In the nobler species of animals and in man it does not replace the lower reflex and instinctive mechanisms, but it is superposed upon these. None of these higher associational (intellectual) activities are possible, except through the mediation of the lower or instinctive centres. Neurologists, accordingly, now distinguished an old brain (palæencephalon), which is common to all members of the vertebrate branch of the animal kingdom, from a new brain (neencephalon), which is practically co-extensive with the cerebral cortex. The new brain with its functions of correlation, is really as old, so far as its first beginnings are concerned, as the old brain; but, whereas the latter attains its full development as a reflex and instinctive apparatus in the lowest mammals, the former continues to increase in size and importance and it is still increasing in the civilized human races of to-day.

"There are no direct tracts leading to the cerebral cortex directly from any peripheral sense organ or from any centre within the brain which is 'pure,' *i. e.*, devoted to a single sensory function. In other words no simple sensory impulses ordinarily reach the cortex, but only nervous impulses arising from lower correlation centres, where complex reflex combinations of various sensory systems are possible. The optic impulses reach the cortex most nearly pure, *i. e.*, with less subcortical associational relation than any other sensory systems (it is no accident that the visual sense plays a dominant rôle in human cortical function); but even here the optic centres in the thalamus from which the optic projection fibres arise are intimately related with acoustic, tactile and other important sensory centres, and in the case of all of the other sensory systems, the projection fibres which enter the cortex from centres which are separated from their respective sense organs by two or more association centres of a high order of complexity. Each of these subcortical associational centres may be dominated physiologically by a single sensory system, but it is structurally adapted for bringing that system into relation with several others, so that the nervous discharge which emanates from it may be the efferent link in a very complex arc. This efferent discharge may enter a still higher association centre, all of whose afferent tracts come from similar lower centres and therefore carry nervous impulses which represent a sort of physiological resultant of the functional factors there interacting.

"A few selected illustrations of the various types of correlation centres may clarify these relations. Fig. 3 illustrates the simplest reflex arc. An auditory impulse coming to the brain terminates in a primary acoustic centre in the superior olive, where it is taken up by an intercalary neurone and transmitted to the nucleus of the VI nerve. The result is a contraction of the external rectus muscle of the eyeball, turning the eye toward the side from which the auditory stimulus was received. This reflex arc operates *per se* in a purely mechanical fashion to produce a determinate invariable type of response.

"The thalamus of lower vertebrates (say all species below the

frog) is probably the organ of the highest associations of which animals are capable. These are mostly the reflex and instinctive plane, though, of course, a limited psychic factor cannot be excluded. The cerebral hemisphere of fishes is dominated by the olfactory system, as the midbrain is by the optic system, and so far as may be inferred from the anatomical evidence, is by no means so efficient an associational mechanism as the thalamus. There is nothing in these animals which can be compared, when physiologically considered, with the mammalian cerebral cortex, though the primordia from which that cortex has been derived in higher animals can be readily identified in them. It is indeed clearly established that the hippo-campal formation (archipallium) has been differentiated from the dorso-medial segment of the wall of the primitive cerebral hemisphere, while the rest of the cortex (neopallium) was elaborated from materials found in the lateral wall of the hemisphere, the somatic area of Johnston. But in fishes and the lower amphibians, there is nothing here which conforms to

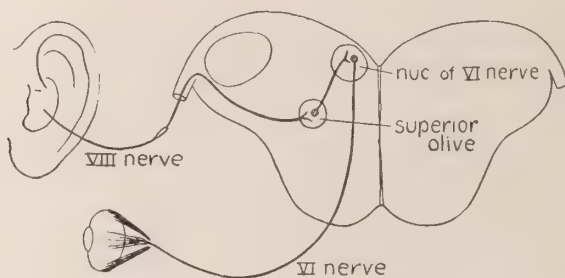


Fig. 3.—Diagram of a simple auditory reflex. Upon stimulation of the endings of the VIII nerve in the ear by sound waves, a nervous impulse may pass to the superior olive, whence it is carried by an intercalary neuron of the second order to the nucleus of the VI nerve. The fibres of this nerve end on the external rectus muscle of the eyeball (Herrick).

our ideas of cerebral cortex, either structurally or functionally considered.

"It is a far cry from an identification of the topographic sources of the structural material from which the cerebral cortex has been gradually elaborated to an adequate understanding of the functional factors which have effected that differentiation. As well might one say that the discovery of the quarries from which the materials for the Parthenon would give an adequate explanation of that architectural masterpiece.

"Starting from the very primitive 'somatic area' of fishes, we can trace in amphibians, reptiles, birds and mammals the gradual differentiation of the non-olfactory parts of the cerebral hemispheres. In the initial stages of its evolution this structure is organized much like the thalamus. It receives no afferent fibres which come directly from any simple primary sensory centre, but only fibres from association centres of the second or third order, which are themselves capable of elaborating complicated reflex responses.



"The thalamus, as we have seen, has its own intrinsic system of association centres, which discharge downward into the cerebral peduncles, and this is the primary reflex apparatus of this part of the brain. The thalamo-cortical connections arose to prominence later in the evolutionary history, though feeble rudiments of these are present in lower brains. Parallel with the enlargement of these cortical connections a special part of the thalamus was set apart for them, and from the Amphibia upward in the animal scale this dorsal part of the thalamus assumed increasingly greater importance. This part is termed by Edinger the neothalamus and makes up by far the larger part of the thalamus in the human and all other mammalian brains. It occupies the dorsal part of the thalamus proper and comprises most of the great thalamic nuclei (anterior, lateral and ventral nuclei, pulvinar and lateral and medial geniculate bodies). The primitive intrinsic reflex thalamic apparatus in man is a relatively unimportant area of medial gray matter and the subthalamic region (corpus Puysii, lattice nucleus, etc., not to be confused with the hypothalamus which lies farther down in the tuber cinereum and mammillary bodies).

"The neothalamus, accordingly, serves as a sort of vestibule to the cortex, every afferent impulse from the sensory centres (except the olfactory system) being here interrupted by a synapse and opportunity offered for a wide range of subcortical associations. The olfactory cortex (hippocampal formation) has a similar relation to subcortical correlation centres in the olfactory area in the anterior perforated space, septum, etc.

"From these anatomical considerations it follows that no simple sensory impulse can, under ordinary circumstances, reach the cerebral cortex without first being influenced by subcortical association centres, within which complete reflex combinations may be effected and various automatisms set off in accordance with their preformed structure. These subcortical systems are to some extent modifiable by racial and individual experience, but their reactions are chiefly of the determinate or stereotyped character, with a relatively limited range of possible reaction types for any given stimulus complex.

"It is shown by the lower vertebrates, which lack the cerebral cortex, that these subcortical mechanisms are adequate for all of the ordinary simple processes of life, including some degree of associative memory. But here, when emergencies arise, which involve situations too complex to be resolved by these mechanisms, the animal will pay the inevitable penalty of failure—perhaps the loss of his dinner, or even of his life.

"The cerebral cortex, then, is not to be likened to the seat of an absolute monarch who receives his messages from outlying parts of his empire in the form of simple sensations and executes his will directly upon his subjects, the bodily organs; but rather to an upper house of parliament, with limited powers of initiating legislation *de novo*, but with remarkably extensive capacity for revision and amplification or veto of such bills as are sent up to it from the lower house and with a very efficient direct control over the entire administrative machinery of the government."

After we have come to appreciate this complicated structure the next natural question is, How does it work, what makes this very complex machine do its work? We may gain some insight into this

problem several centuries old but not yet solved, by noting a few of the conditions which have a marked influence upon it.

For several years Rogers and the writer have been interested in a critical study of nerve cells which the following briefly summarizes. It is found that a large number of terms have been used in describing the various minute parts of the cytoplasm of the nerve cells, and these structures have received a wide range of interpretation.

We find no less than eleven distinct technical terms employed to designate these structures, all of which are derived from a study of fixed and sectional material. In our own work we have uniformly made use of the living, unstained material, and have used fixed, hardened, sectioned and stained material for control purposes only. During the more than four years in which we have examined the nerve cells from hundreds of animals, we have failed to find in a stained preparation any structure or appearance which we had not already seen to as good or better advantage in the unstained living cells.

The fact that so many terms are used by writers on nerve cytology to designate these stainable substances is an indication of a large amount of uncertainty as to their significance. In addition to these bodies which range in designation from Nissl bodies to tigroid granules, there is also present pigment, which in some cases at least has been confused with the so-called Nissl bodies. This error is doubtless due to the fact that the observations were made upon fixed material.

*Vacuoles.*—The structure of the cytoplasm of the nerve cells of many invertebrates is modified by the presence of vacuoles, lymph spaces, and the actual, though infrequent penetration of nerve cells by capillaries. The vacuoles appear in the cytoplasm, nucleus, and nucleolus, and are probably in each case formed in a similar manner even when the exciting cause is different. The vacuoles which appear in the nucleolus are similar to those that occur in this structure in ova during their growth in most animals. The vacuoles that occur in the nucleus are not so common and it is doubtful whether they are normally present. So far as we are aware, they have not been seen in the living nerve cells, but are common in cadaveric specimens. Nerve tissue which is poorly fixed may also exhibit them, a fact which renders it likely that they are artefacts. The vacuoles in the cytoplasm are present in the nerve cells of many animals, both vertebrate and invertebrate. They can be seen in the living cells of the Gastropods and in the crayfish, and have been reported in some vertebrate nerve cells. In well-fixed and stained sections vacuoles are very commonly found which agree in form and position with the condition in the living cells. Considerable work has been done to determine whether or not the cytoplasmic vacuoles have a definite wall. It is necessary in this connection to distinguish them from the lymph-spaces and capillaries. The vacuoles are usually small and irregularly distributed throughout the cytoplasm, though in some cases they may be very large. These large vacuoles are very likely formed by the running together of several of the smaller vacuoles. They contain a homogeneous liquid or differentiated bodies, and their presence is, we believe, intimately associated with the metabolism of the cell. They vary in number in the same animal and in the same species, a fact which would indicate that they are transitory structures which appear



under the influence of certain chemical changes within the cell, and then disappear.

*Lymph Canals.*—The lymph-spaces are of a different character and are usually located in the periphery of the cytoplasm. They are intimately associated with the circulatory system and may contain blood corpuscles; in some of the larger invertebrate nerve cells the periphery is richly supplied with them. These canals or spaces can in many instances be traced directly into the surrounding neuroglia tissue, and appear to be of a more permanent character than the vacuoles. We are inclined to believe that these lymph canals are supplied with definite walls.

*Capillaries.*—A sufficient number of instances have been observed by us as well as described by others to show that occasionally nerve cells are actually penetrated by capillaries. These capillaries



Fig. 4.—Sagittal section of left cerebrum 2 cm. from the longitudinal fissure (from a photograph). The tumor is situated in the frontal lobe on the right-hand side, overlapping the edge of the plate.

terminate in finger-like branchings, and may pass completely through the cells or even through two or three adjacent cells. They are bounded by a definite wall and may contain corpuscles.

*Nutritive Bodies.*—We have already described the presence of pigmented and non-pigmented bodies in the nerve cells of certain of the mollusca in an earlier research than the one cited in the bibliography. Since the publication of that report we have continued our observations upon a large number of forms. We find that as a group the mollusca are characterized by the presence of pigmented or non-pigmented bodies in the nerve cells. While the bodies are evidently not identical in their composition, they are nevertheless closely similar and force upon us the belief, that with the similarity of form and structure there must also be associated a general, though not of necessity a specific, similarity of function. If then we find ourselves in position to make a definite statement concerning the functions of these bodies in one or more forms we may then naturally expect that similar structures in other nerve cells may serve a similar function. In the discussion which follows we shall endeavor to show the probable function of certain of these bodies and indicate the way along which we are working in order to demonstrate their functions in other forms.



In the nerve cells of *Limax maximus* we meet with a very interesting set of conditions. Here the solid bodies form a conspicuous mass in the outer portions of the cytoplasm, and are usually more numerous in the end of the cell from which the axon arises. They are to be found even in the parts of the cell more remote from the axon, though they are not so numerous. In form they are rounded granules of a light yellow substance, measuring up to 5 micron in diameter. Usually the granules are to be found lying within the limits of vacuoles, though this is not invariably the case. It is an interesting fact that the granules remain separate and distinct instead of being clumped into a solid mass, even when most numerous in the cells. We frequently find cells in which the granules may form two or even three distinct layers in the outer portions of the cytoplasm, while at the axon end of the cell the cytoplasm will be almost entirely filled with them. Even here the granules that may be recognized are minute, distinct bodies. In these same cells the vacuoles form a striking set of characters. They are to be found interspersed among the solid bodies, and not in any other portions of the cell. This fact alone is sufficient to indicate a close relationship between the solid bodies and the vacuoles.

The studies which we have made upon the nerve cells of the mollusca present strong indications of an intimate relation between the physiological conditions or states of the animal and the structural character of its cells. This fact indicates the possibility and even the probability that much of our current histology is at best only one-sided on account of the structure of the various tissues and organs, in that it presents only the conditions of the cells during one period of activity, while there are other definite conditions which are just as well established and just as normal.

For a long time it has been recognized that epithelial and, in particular, gland cells present various appearances depending upon their state of activity or repose. These differences in appearance are brought about through the exercise of the special functions which the cells are called upon to perform. The less evident processes involved in the life of the cell are in a way separate and distinct from these special functions (secretion, excretion, etc.). It is readily apparent that the cell carries off wastes, in short, exhibits all the properties of the living mass of protoplasm, irrespective of the special function, which is more or less intermittent in character and appearance. We are compelled to believe that the same rule holds for the cells of the nervous system; that the displays of nervous energy seen in the various impulses sent out by the nerve cells are the special functions of these cells. In addition to these there are the ordinary processes of cell repair, growth, and removal or wastes which are less evident. Each nerve cell is then a unit capable of performing two sets of functions—a special, and a common or vegetative. These two sets of processes are more or less intimately connected; both require the expenditure of energy. In order that the cells may carry on this special work, it is necessary that a supply of latent energy be constantly available for use; this we believe, and will attempt to show, to be prepared in the form of a certain definite substance stored up within the cells during periods of rest and good nourishment. In times of stress these stores are made available for the energy-spending processes of nerve action, and so provide against the total destruction or even serious injury of the

protoplasmic unit which is the physical basis of nervous activity. If the store of energy-supplying substance is consumed by long continued activity on the part of the nerve cells, the protoplasmic cell breaks down in its effort to supply energy for the special function, and so leads to its injury or destruction.

Experiments which are now under way by the writer, and which have not been published, upon one of the fish, *Amia calva*, promise to reveal some very interesting results. The writer has been able to keep one of these fish for eighteen months in a tank of running water without food. During this entire period the fish kept up a constant respiratory movement showing that the motor cells regulating this reflex were continuously acting during this long period of starvation. Just what the condition of these cells will be when they are examined is at present unknown. A similar series of ex-

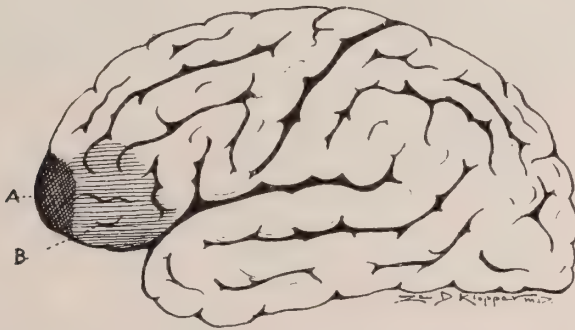


Fig. 5.—A, smaller tumor, denser than the subcortical one, but the same histologically, adherent to the parietal dura opposite the left eyebrow; B, area of softening.

periments carried on by the writer upon *Necturus* for some sixteen months showed the cytoplasm of the sensory cells of the spinal nerves to be almost completely occupied by a fluid. The gray substance of the cord was very much reduced in amount and took a stain with great difficulty. Recently Cannon and Burket have shown that the nerve cells in the myenteric plexus are influenced by anemia or other physiological conditions which involve a local lack of oxygen. The nerve cells of this plexus are the most hardy nerve cells thus far found in the body. The persistent condition of anemia for three and a half hours or longer almost inevitably results in the loss of functions, and a disappearance of the nerve cells in the affected part.

There is another avenue of approach to the problem of how the nervous system works—namely, the chemical. For many years it has been thought that nervous activity was influenced by the presence of phosphorus. That such is not really the case in spite of popular notions on the subject, the following tables taken from a research by Koch indicate.

TABLE I.  
Percentage of Phosphorus in Body Tissues.

	Total Phosphorus	
	Per cent. in Dry Fat-Free Tissue	In Moist Tissue
Muscle. . . . .	0.90-1.50	0.22-0.38
Liver. . . . .	1.34-1.60	0.34-0.40
Kidney. . . . .	1.34	0.42
Pancreas. . . . .	1.70	0.40
Brain. . . . .	1.44-1.50	0.33-0.35

"From Table I it is evident that the brain has by no means an unusual amount of phosphorus in comparison to the other tissues. As the above figures apply to the normal brain the question arises whether it may not be necessary sometimes to supply the brain with phosphorus when its total store has become decreased."—Koch.

TABLE II.  
Percentage of Lecithin in Body Tissues.

Tissue	In Dry Matter	Total Phosphorus
Pancreas. . . . .	5.0	12.0
Muscle. . . . .	5.0	15.0
Kidney. . . . .	8.0	25.0
Liver. . . . .	10.0	26.0
Brain. . . . .	27.0	73.0

TABLE III.  
Composition of Brain Tissue in Normal and Diseased Brains.

	Normal Age 16	Dementia Præcox Age 17	Normal Age 43	General Paralysis Age 44
Proteins. . . . .	37.1	39.0	38.0	39.1
Lipoids. . . . .	52.0	51.6	52.0	50.8
Extractives and Ash. . . . .	10.9	9.4	10.0	10.1
Total Phosphorus . . . . .	1.50	1.47	1.50	1.44
Lecithins. . . . .	27.3	27.8	27.0	24.8

"There is practically no difference between the lecithin content of the brain in dementia præcox and that in health, while in general paralysis there is slight decrease in total phosphorus, and a larger one in lecithin phosphorus. Even the latter, however, is nothing like what one would expect, considering the severity of the disease; indeed, not all cases of paralysis show as much change. The actual amount of lecithin lost is not indicated in the above figures which are relative; but on account of the inability of the central nervous system to regenerate, this could not be replaced in any case. We come, therefore, to the rather surprising conclusion that



even in extreme states of exhaustion the brain is plentifully supplied, not only with phosphorus, but also with its special form of phosphorus—namely, lecithin. Such results as these might indicate that chemical methods are not capable of detecting differences of physiological significance and consequently are to be discredited. That such is not the case I shall have occasion to demonstrate in reporting a case of dementia præcox in a subsequent article, in which very marked chemical differences of another kind, which distinguished this subject from the normal will be distinguished. Furthermore, that those methods are capable of detecting differences when such differences exist is well illustrated in Table IV, where the brains at different ages are compared.”—Koch.

TABLE IV.  
Variation of Brain During Growth.

Case:	At Birth		Sixteen Years		Forty Years	
	No. 13*		No. 20*		No. 70*	
Weight of Brain:	640 grm.		1,440 grm.		1,400 grm.	
	Per Cent.	Grm.	Per Cent.	Grm.	Per Cent.	Grm.
Solids. . . . .	11.2	71.68	21.2	305.28	23.0	322.0
Proteids. . . . .	46.6	33.40	37.1	113.26	38.0	122.36
Lipoids. . . . .	33.1	23.72	52.0	158.74	52.0	167.44
Extractives and Ash	20.3	14.56	10.9	33.27	10.0	32.20
Total. . . . .	1.72	1.23	1.50	4.58	1.5	4.83
Lecithins. . . . .	24.2	17.3	27.3	83.3	27.0	86.9

\*The subject in Case 13 died at birth. In Case 20 the subject was a boy employed in hotel. In Case 70 the subject was a physician.

We may well summarize the results in Koch's own language: “(1) There is no evidence of any need to supply phosphorus to the brain in conditions of exhaustion, as a lack of that element has not yet been demonstrated. The actual amount lost in the exhaustion of general paralysis cannot, of course, be replaced on account of the inability of the central nervous system to regenerate. (2) The phosphorus required for the growth of the brain is amply supplied by the phosphorus of our daily diet. If desired, the addition of phosphorus-rich foods, such as eggs, sweetbreads (pancreas), liver, and some meats, can be made to meet further requirements, and will far exceed in amount the phosphorus obtained in less natural form from the prescribed dose of any of the various drugs in commercial use. The use of such foods, however, is limited by their richness, and their tendency on account of their rich fat content, to interfere with gastric digestion. (3) As far as the nervous system is concerned, the addition to the diet of commercial phosphorus compounds, such as hypophosphites, glycerophosphate, phytin, lecithin, etc., is to be discouraged because in the first place, there is no conclusive evidence that they have any effect on the growth of the brain, and second, the amount usually recommended means only a very insignificant addition to the amount of phosphorus (even in its special forms such as lecithin) taken with the daily food.”

Phigini has recently reported a distinct variation in the normal condition of the brain in cases of progressive paralysis. The proportion of water is increased and the relations of the significant lipoid are decidedly upset. The abnormal condition in this abnormal brain studied, showed that a substance known as cholesterol is increased and another substance known as phosphatids of the kephalin type are decreased so that it may be said that a sort of 'cholesterol degeneration' takes place. Just what this means is not understood at the present time. It has been suggested that kephalin which has a great avidity for oxygen and so must be intimately related to respiration of nerve cells, is of great value. The decrease in this specific substance then may be the actual cause of the brain abnormalities in progressive paralysis. We may expect many important contributions to be added to the chemical study of the brain and the general nervous system of animals in the next few years.

In this connection it is pertinent to mention the investigations of zoologists and physicians upon the ductless glands. It seems that the thymus, thyroid, adrenal, pituitary, and pineal body are all intimately associated. For example, the thymus reinforces or stimulates the pituitary during the period of rapid growth of bone, and also stimulates the adrenals; while the thyroid stimulates the pituitary. The normal secretion of the thymus seems to be of great importance in the normal unfolding of mentality. It is suggested that feeble-minded children (not cretins) are deficient in thymus secretion. Strange to say, such children are frequently helped by thyroid medication. As growth continues, the thymus degenerates and the secretion from the thyroid comes to take its place. When the thyroid is absent or its secretions deficient in the child, he becomes short and stunted; becomes fat and flabby with a round, expressionless face and a sluggish mind, semi-idiotic. Such cases are also helped by using thyroid extract.

Cushing says of the pituitary that there are "two conditions, one due to a pathologically increased activity of the pars anterior of the hypophysis (hyperpituitarism), the other to a diminished activity of the same epithelial structure (hypopituitarism), which seem capable of clinical differentiation.

"The former expresses itself chiefly as a process of overgrowth, giantism, when originating in youth, acromegaly when originating in adult life. The latter expresses itself chiefly as an excessive, often a rapid deposition of fat with persistence of infantile sexual characteristics when the process dates from youth, and a tendency toward a loss of the acquired signs of adolescence when it first appears in adult life."

The strange and almost unbelievable fact that the growing human mind can be released in cases of mental deficiency by administering a definite chemical substance is one of the marvelous discoveries of the present day.

While the detailed knowledge of fibre tracts is of great value in understanding the relation of the several centres and emphasizes the isolation of the cerebrum from direct contact with the outside world except through the olfactory tracts, it does not tell us how the machine works. Nor does the effect of starvation nor the researches of Koch on the chemical composition of the brain explain the mystery. Each, however, is a definite and important contribution to our knowledge of the nervous system. In the same way, a

study of some of the conditions which disturb the normal nervous responses extends our picture of the nature of the nervous system. The ease with which the central nervous system carries on its complicated work depends upon the general state of the whole body. Muscular and mental fatigue, hunger, temperature and other conditions which effect the state of the body, also have an influence upon the way in which the nervous system works. The effect of opium which usually stimulates the imagination and of alcohol which makes the average person sociable and talkative are easily recognized. Anesthetics are able to cause one to lose consciousness for a time. Disease may weaken the body so as to render one incapable of thinking, and when localized in the brain may cause strange defects.

The following 4 cases throw an important sidelight upon the working of the human mind. In each instance different abnormal conditions are present, caused by a specific diseased condition of a definite region.

Spiller reports a man, aged forty-two years, complained of an enlargement in the left parietal region; the right side of the body was weakened and there was a tendency to staggering. His memory became poor and when speaking he had definitely in mind what he wanted to say but had difficulty in expressing himself. He gradually grew worse until he could not write at all. A section of bone comprising the outline of the tumor mass was removed by means of trephines and chisels. It was greatly thickened. The dura was found somewhat thickened, but was not opened, as the abnormal thickness of bone seemed to be sufficient to account for the symptoms. The man made almost complete recovery, attended to his business as formerly, and seemed well but had a return of symptoms a few months later. Four months later a second operation was performed as the patient was unable to write, becoming confused when he attempted to speak and had difficulty in walking. This time the dura was cut and a tumor was located and removed. Recovery was complete.

Langdon and Cramer describe a case, that of a woman, aged thirty-two, who in childhood had received a blow on the left parietal region from a croquet mallet. The family noticed a gradual development of certain abnormal mental states and sought consultation. When asked if she saw anything unusual, she answered, "Yes; holes in the ceiling and walls; small ones; many of them." There was no defect in ceiling nor was it papered. There was nothing to be mistaken for holes; in other words, this was a true hallucination, not an illusion. While the pupillary reactions were being looked for, she volunteered the information that her eyes had been operated upon a short time before and when asked if anything else had been done, she replied, "Yes, my right leg was cut off recently." A tumor was removed from the hip, shoulder and elbow area of the brain, and the patient recovered.

Randolph describes the presence of a sarcoma in the left parietal lobe of the brain without definite symptoms until shortly before death. A sentence spoken to her in French was understood, and a brief but pertinent answer made in the same language. She states correctly the names of flowers and their colors when shown to her. She gave correctly the names of members of her family; also that of her nurse, who had been with her two days, but was



unable to give that of her physician whom she had seen less than half a dozen times. She could not give the street or number of the house in which she lived. She stated correctly the name and function of a pen and a piece of money. When shown a napkin ring, she called it a 'ring,' and said it was used to 'eat with.' When questioned, her expression denoted great confusion. She would look from one person to another, as if seeking assistance, and wrinkle her forehead as if making an effort to express herself. All her answers were given slowly after more or less delay, necessitating frequent repetition of questions.

On request she wrote her name perfectly. A sentence of six words was given, and she was asked to repeat it, which she did, slowly but accurately. Asked to write the same sentence, she did so perfectly except the last word which was not completed. She kept on writing, repeating the words of the sentence irregularly and without sense, misspelling words, leaving them unfinished, making a jargon. Her penmanship at the same time progressively lost its character, becoming like the scrawl of an untaught child. She stopped writing only when she had filled the page. She was then asked to write a sentence of eight words without first repeating it. She wrote no part of this correctly, repeating two or three words of the sentence, leaving them incomplete, and using the same immature style of penmanship. After writing thus three or four lines, she stopped. It is a matter of regret that the specimens of writing were lost, being thrown out by a hospital clerk, when the record was filed.

The patient was with difficulty persuaded to read a passage, but after beginning read fluently, and in the main accurately. It was noted that she miscalled the word 'Australian' for 'Austrian'; for 'lawyer' she substituted 'solicitor.' She died June 13th, apparently of medullary paralysis. In the illustration (Fig. 4) the position of the tumor, and the extent of the diseased area is shown. This is an unusual case and perplexed attending physicians very much because they were unable to determine the exact cause of death for one says, "What was the cause of death? There was no heart or lung or kidney affection, primary or secondary. Death apparently ensued from medullary paralysis. There was no apparent lesion in the medulla or its environment, though carefully searched for. I am unable to explain this."

The fourth case is fortunately reported over the name of Edinger, a man whose scientific reputation cannot be questioned. He finds a human being without cerebral hemispheres. Fortunately the child was under observation until the fourth year when it died, due to pulmonary tuberculosis. Several important observations were made which cannot be reported at this time. One of the most important facts in this case in regard to the problem under our consideration is that the child lived for four years. The symptoms of the child suggested some serious disturbance in the brain, but were not such as to lead the observers to anticipate the complete absence of the cerebrum. The cerebral region was entirely occupied by a membranous sac filled with fluid. The remaining portions of the brain were apparently normal. This child showed no intellectual growth. It slept unless awakened and never learned to take food other than by sucking.

These illustrations of disease might be greatly extended, but they

would only serve to illustrate the same general problems, that is, that the normal work of the nervous mechanism may be interrupted or even destroyed when certain definite portions of the brain become diseased. The scientific investigations of the past few years have served to throw a great deal of light upon the origin and nature of the nervous system. The investigations which are now under way will help to clear up some of the remaining unsolved problems. These studies are being carried on by biologists as well as physicians, and it will only be a short time before a new summary will need to be made for those who wish to keep abreast of the latest thought.

Since writing the above summary of the recent contributions to the nervous system, an important article upon "The Development of Reflex Mechanisms in *Amblystoma*"\* has appeared, written by Herrick and Coghill.

We have been accustomed for years to think of the simple reflex shown in Fig. 1 as a primitive condition. This investigation, however, maintains that just the reverse is true—namely, that this simple reflex arc is really a specialization and that at least two more complex stages precede it in the larval *Amphibia*.

Before the nervous system becomes differentiated into its adult relations, two stages occur. The first of these is associated with the swimming reflex. At first the peripheral sensory neurons lie within the spinal cord (these are the transitory dorsal giant cells of Rohon-Beard). Their dendritic processes pass outward to both the skin and the embryonic muscle segments. The axons from each of these cells ascend in a dorsolateral sensory tract.

In the youngest stages which are capable of responding at all to external stimuli, commissural fibres from this ascending tract cross only at the lower end of the medulla oblongata. After they cross, they effect connection with the cells of the descending motor tract. This indicates that the earliest reflex responses in *Amblystoma* require a complex chain of neurons, whose relations are quite different from those of the short, definitive reflex arc of the adult animal.

The spinal cord of the urodele larvæ shows a reflex mechanism much more complex than that of the early swimming larva, though still very different from that known in the spinal cord of adult higher vertebrates. For the technical details and illustrations, the reader is referred to the original article.

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\**Jour. Comp. Neurol.*, 1914, Vol. XXV, No. 1.

## DIAGNOSTIC AND THERAPEUTIC NOTES.

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**SALVARSAN-SODIUM.**—Dreyfus, Wechsellmann (*Muench. med. Wochenschr.*, 1915, No. 6). In spite of the convenience of neosalvarsan, clinicians continue to use the old salvarsan on account of its apparently greater potency. To combine the advantages of both kinds of salvarsan, Ehrlich has devised still another modification, which he calls 'salvarsannatrium.' Chemically, it is the same preparation, in solid form, that we have hitherto produced, each for himself, by adding alkali to the solution of salvarsan. It is a fine, golden yellow powder, very soluble in water and rapidly deteriorating on exposure to the air. In the process of deterioration it grows dark brown, becomes less soluble and more toxic. In the unopened ampoule it keeps indefinitely. The dose is the same as that of salvarsan, its activity equal to the latter, while its mode of use is as simple as with neosalvarsan.

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**MORELLI'S REACTION IN TUBERCULOUS PLEURITIC EXUDATE.**—Zannini (*Riv. osped.*, 1914, No. 12). Morelli's test is as follows. A test-tube is partly filled with a saturated aqueous solution of corrosive sublimate. On the surface of the latter, 3 or 4 drops of the pleuritic fluid to be tested are allowed to fall. If the fluid is an exudate, a heavy compact, yellowish coagulum forms, that either sticks to the wall of the test-tube or sooner or later falls as a single, solid mass to the bottom of the tube. If the fluid is a transudate, on the other hand, the clot is much more delicate and soon disintegrates into small flocculi. The diagnostic value of the test lies in the fact that, in this respect, tuberculous exudates behave like transudates, though in other respects identical with other exudates from which they may thus be distinguished.

Zannini applied this test to 13 transudates and 35 exudates. All the transudates formed the characteristic fragile clot. Of the exudates, 20 formed a firm clot, 15 a fragile one. These 15, however, comprised just the tuberculous cases. He believes, therefore, that the Morelli test has great diagnostic value.

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**ABDOMINAL ANGINA.**—Breitmann (*Zentralbl. fuer inn. Med.*, 1914, No. 46). Angina abdominis is in all respects analagous to angina pectoris. It may be due to a sclerosis of the abdominal vessels or to arterial spasm. The symptoms are a painful meteorism, due to intestinal paresis; abdominal pain, sometimes of extreme severity; epigastric pulsation, pallor, vertigo, fainting. The differential diagnosis is based upon the exclusion of disease of the ab-



dominal viscera. The prognosis is ordinarily bad, since the affection is an expression of advanced cardiac and arterial sclerosis. The treatment consists of rest, hydrotherapy, milk and vegetable diet, abstention from alcohol and tobacco, adonis vernalis, nitrites, diuretin and iodine.

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THE RESTORATION OF OLD TINCTURE OF IODINE.—Roques (*Jour. de Méd. et de Chir.*, 1915, No. 3). On standing, tincture of iodine gradually becomes contaminated through the formation of hydriodic acid, which interferes with its usefulness. Roques has worked out an ingenious method by means of which the original purity of the tincture may be restored. The procedure is based upon two phenomena: the power of iodic and hydriodic acid mutually to destroy each other with the formation of iodine and water, and the complete insolubility of iodic acid in 95 per cent. alcohol. To the contaminated tincture a small amount of finely powdered iodic acid is added, and the whole vigorously shaken for five minutes. The excess of iodic acid is then allowed to settle to the bottom; the supernatant liquid is acid-free tincture of iodine.

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LOCATING NEEDLES IN TISSUES.—Monks (*Boston Med. and Surg. Jour.*, 1915, No. 8). The finding of needles buried in the tissues is often an exceedingly difficult matter. If, however, the buried needle be magnetized, its localization becomes relatively easy. Monks suggests the following procedure:—

(1) The buried needle is magnetized by passing a magnet over the locality where this needle is supposed to be. The best results are obtained when the long axis of the magnet is in the same line as the axis of the needle. (2) The examining needle (suspended in the middle from a fine silk thread) is then slowly passed over the same locality. In the event that it passes over the buried needle—provided that needle is not too far away from the surface—one end or the other of the examining needle will be attracted and will dip in the direction of the buried needle somewhat in the same manner as the 'divining rod' is said to do, when that rod is brought to a place on the ground under which water can be found. As the buried needle, after it has been magnetized, has two poles (N and S), and as the examining needle has also two poles (N and S), it follows that (according to the physical law, that 'like magnetic poles repel one another, unlike poles attract one another') the N pole of the examining needle is attracted to the S pole of the buried needle, and the S pole of the examining needle is attracted to the N pole of the buried one.

## BOOK REVIEWS.

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**DISEASES OF THE SKIN.** Including the Acute Eruptive Fevers. By Frank Crozer Knowles, M. D., Instructor in Dermatology, University of Pennsylvania, etc. etc. With 199 Illustrations and 14 Plates. Philadelphia: Lea and Febiger. 1914. Price, \$4.00.

We have had quite a deluge of books on skin diseases lately, and we hear of several in preparation. They all follow the same plan laid down many decades ago. All are 'guides' to the student and general practitioner in the study of dermatology; all are alike; they vary little, even in the text, and there is not the personal element one would like to see in any of them, especially in the smaller books such as this one.

Knowles' work varies somewhat from the others in giving a short résumé of the eruptive fevers and helpful suggestions as to their differential diagnosis. It is profusely illustrated and the illustrations are really better than in most books on skin diseases.

The chapter on syphilis is modern and up-to-date; and, although he says in his definition that syphilis is due to a specific organism, he does not mention, in the definition, the name of the organism, which is undoubtedly an oversight. Why the author does not dwell upon Noguchi's epoch-making work upon the *spirochaeta pallida*, its cultivation, etc., is hard to understand when the unconfirmed work of McDonagh is seemingly accepted.

The reviewer would gladly welcome the day when a comprehensive book on skin diseases is written, one that deals largely with generalities and places more stress upon the relationship between skin diseases and internal conditions; one which shows that the author has studied these diseases from the standpoint of modern medicine, not alone from that of morphology; has studied it in relation to the various modern interpretations of chemical pathology, the ductless glands, blood-pressure, metabolism, and one in which we do not have the old prescriptions laid down for indigestion and dyspepsia.

We are not criticising Knowles' book; we are speaking in generalities, and our remarks apply to most of the textbooks on skin diseases that have come from the press in the last decade. Precedent is one of the greatest handicaps to progress; therefore, one, in writing a book upon diseases of the skin, no doubt fears to deviate from the well-worn paths of celebrated authors; and thereby a lot of obsolete 'stuff' creeps into a book which should have been left out years ago.

After carefully reading the work under discussion, we can truthfully say that it is a fair representative of the modern textbook on skin diseases. The author gives a clear and lucid description of all the diseases in question, and ably dwells, with the usual technique, upon etiology, pathology, diagnosis and treatment.

**OBSTETRICAL NURSING.** A Manual for Nurses and Students and Practitioners of Medicine. By Charles Sumner Bacon, Ph.B., M. D., Professor of Obstetrics, University of Illinois and the Chicago Polyclinic, etc. etc. Illustrated with 123 Engravings. Philadelphia: Lea and Febiger. 1915. Price, \$2.00.

The truly valuable nurse is the one who is interested in her work, who is capable of rendering efficient assistance to the physician in emergencies, and who can deal with situations, serious or otherwise, which may require action in the absence of the physician. Since it is probable that in no other field of nursing is the justifiability for such demands on a good nurse more evident, it is, therefore, necessary to give to the nurse a good deal of purely scientific and technical information and instruction in obstetrics, although such practice undeniably presents a serious feature, one full of danger and objectionable in many aspects, in the complex problem of efficient nurse training. Thus it

has become the chief aim of writers of textbooks for nurses to include all that the nurse should understand, but to eliminate carefully what might be regarded 'dangerous knowledge.'

In perusing Bacon's new volume, one is impressed by the fact that he apparently has found that golden middle road between too much and too little information. He presents scientific facts precisely, but continually interpolates much practical advice in regard to the specific nursing problems. He expresses his own ideas—undoubtedly the result of personal experience—but without becoming dogmatic, always suggesting the possibility of a justified difference of opinion among physicians, a point of importance in the training of nurses. Bacon's book has not only all the earmarks of a book that will appeal to nurses, but a conception of the subject that cannot fail to enlist the interests of every practitioner doing obstetric work.

**STUDENT'S MANUAL OF GYNECOLOGY.** By John Osborn Polak, M.Sc., M. D., F. A. C. S., Professor of Obstetrics and Gynecology, Long Island College Hospital, etc. etc. Illustrated with 100 Engravings and 9 Coloured Plates. Philadelphia: Lea and Febiger. 1915. Price, \$3.00.

In this manual Polak proves his qualifications to write a concise but complete work on gynecology, which reflects the advanced thought on the subject without elaborating too extensively on disputed problems. The material is arranged, in general, in accord with the various regions of the genital tract, an arrangement not entirely satisfactory for the purpose of teaching, but preferable, in this instance, since it was the author's intention to give to the student and practitioner a small volume to refresh quickly his memory concerning any doubtful point. The discussion of physiology and pathology, but especially of therapy including operative procedures, is remarkably complete and clear considering the comparatively small size of the book. This "Manual of Gynecology" represents a worthy companion to the author's "Manual of Obstetrics."

**THE HEART IN EARLY LIFE.** By G. A. Sutherland, M. D., F. R. C. P., Senior Physician to the Hampstead and North-West London Hospital, etc. etc. New York: Oxford University Press. 1914. Price, \$2.00.

The great progress made within recent years in connection with the study of the functions and diseases of the heart has necessitated a radical revision of traditional ideas on this subject. Only the most recent textbooks handle the subject according to present day notions, and even they treat the juvenile heart and its affections inadequately. This is the more to be deplored in view of the extreme importance of the subject. Not only do most cases of rheumatic heart disease begin during these years, but they are then most amenable to treatment. On the other hand, a lack of intimate acquaintance with the normal juvenile heart has led many a physician to condemn children, with a fundamentally normal circulatory condition, to a life of semi-invalidism. The careful perusal of Sutherland's interesting little book may be confidently recommended to every young physician, especially if his work leads him in the direction of pediatrics.

**ABDOMINAL OPERATIONS.** By Sir Berkeley Moynihan, M. S. (London), F. R. C. S., Leeds, England. Volumes I and II. Third Edition, Revised. Fully Illustrated. Philadelphia and London: W. B. Saunders Company. 1914. Price, \$10.00.

The distinguished author is seemingly well satisfied with the boundaries which he previously set up for himself, and in this new edition we fail to discover any excursion into new territory. The purpose of the revision has evidently been merely to suggest refinements of technique, and of these we note none of very considerable moment. In fact, the author seems rather hard put to fill out certain sections to an extent commensurate with a two-volume work. We note with pardonable pride the unmistakable tribute which the author in his preface pays to American surgery; this agreeable complimentary note compensates in part for the closing paragraph of a recently edited textbook of surgery in which the English author makes a somewhat discouraging reference to Professor George Crile, of New York. This reminds us, too, that Mr. Moynihan counts himself an ardent advocate of Crile's anoci-association theory, while in the book he fails to show that his conception of the application of the technique extends beyond the injection of a local anesthetic substance into and slightly beyond the bounds of the incision. All in all, the new edition is an improvement over the last, and the



editor and publishers are probably justified in its production. We believe it would be a more generally useful work if the author might be induced to include operations upon the pelvic viscera, the bladder and kidney, and herniæ, all of which at times certainly lie well within the province of abdominal surgery.

STATE REGISTRATION FOR NURSES. By Louie Croft Boyd, R. N., Graduate Colorado Training School for Nurses, connected with City and County Hospital, Denver, Colo., 1899, etc. etc. Second Edition, Enlarged. Philadelphia: W. B. Saunders Company. 1915. Price, \$1.25.

The author in this volume has compiled a comparative summary of the laws in the United States governing the registration of nurses. The double value of such a work would seem obvious. Not only does it present a ready reference for a trained nurse who is choosing her field of future professional activity, but it is also extremely useful for all those interested in the passing of appropriate laws in states contemplating such legislation. The author quotes existing laws and carefully points out their defects and advantages respectively. Considering the general interest at present manifested all over the country in such legislation, the appearance of this volume must be regarded as very timely and most welcome.

THE DISEASES OF CHILDREN. By Henry Enos Tuley, M. D., Late Professor of Obstetrics, University of Louisville, Medical Department, etc. etc. With One Hundred and Six Engravings and Three Colored Plates. Second Revised Edition. St. Louis: C. V. Mosby Company. 1913. Price, \$5.50.

The second edition of Tuley's textbook shows a complete revision, and the work has been brought thoroughly up to date. If at times clearness has been sacrificed to brevity, it is none the less true that the whole subject of modern pediatric practice has been covered in a satisfactory manner. The inclusion of special milk formulæ, as well as the short discussion of dairy hygiene and milk commission standards, adds considerably to the value of what is surely a useful book.

MECHANO-THERAPEUTICS IN GENERAL PRACTICE. By G. de Swietochowski, M. D., M. R. C. S., Fellow of the Royal Society of Medicine, etc. etc. With 31 Illustrations. New York: Paul B. Hoeber. 1914. Price, \$1.50.

An attempt is made in the pages of this little volume to point out where mechano-therapeutics is likely to prove useful. A word is also said about technique. The author's leading idea is to make the whole concise and clear so that it can serve as a practical guide in general practice.

DISSECTION METHODS AND GUIDES. By David Gregg Metheny, M. D., L. R. C. P., L. R. C. S. (Edin.), L. F. P. S. (Glas.), Associate in Anatomy, and for Sometime Senior Demonstrator in the Daniel Baugh Institute, The Department of Anatomy and Biology, Jefferson Memorial Medical College, Philadelphia. Illustrated. Philadelphia: W. B. Saunders Company. 1915. Price, \$1.25.

This little book, as indicated by the author, is intended simply to bridge the gap that exists between the descriptive textbook and the dissecting table. It may be used in connection with any of the standard textbooks. Undoubtedly it will serve as a help and a guide to a better knowledge of anatomy. The book is illustrated by simple but helpful diagrams.

A TEXTBOOK OF PATHOLOGY. With a Final Section on Post-Mortem Examinations and the Methods of Preserving and Examining Diseased Tissues. By Francis Delafield, M. D., LL.D., Emeritus Professor of the Practice of Medicine, College of Physicians and Surgeons, Columbia University, New York, and T. Mitchell Prudden, M. D., LL.D., Emeritus Professor of Pathology, College of Physicians and Surgeons, Columbia University, New York. Tenth Edition, Revised with the Coöperation of Francis Carter Wood, M. D., Director of Cancer Research, Columbia University, New York. With Fourteen Full-Page Plates and Six Hundred and Ninety-Four Illustrations in the Text, in Black and Colors. New York: William Wood and Company. 1914. Price, \$6.00.

When we see Tenth Edition on the title page of a textbook it seems rather unnecessary to attempt any considerable review. This work of Delafield and Prudden has long been the standard textbook for the majority of students of pathology throughout the country. In the present edition the work has been

brought well up to date by the addition of all the more important advances in the knowledge of pathology that have occurred since the publication of the last edition. The same clear and charming presentation of the subject, for which this book is so well known, has been maintained. The subject-matter of the volume is well arranged and includes both general and special pathology and pathological technique. The illustrations are excellent and the press work first class in every respect.

**CANCER: ITS CAUSE AND TREATMENT.** By L. Duncan Bulkley, A. M., M. D., Senior Physician, The New York Skin and Cancer Hospital, etc. New York: Paul B. Hoeber. 1915. Price, \$1.50.

It is not the purpose of the reviewer to pass criticism upon Dr. Bulkley's book, but rather to outline briefly his idea upon the subject. Written by a man with wide experience, the work deserves sober consideration, however greatly the views expressed may differ from the prevailing opinions. The author believes that micro-organic or parasitic origin of cancer may be safely discarded as a working theory; that it is not hereditary to an appreciable degree nor does injury play an important part. He believes, on the other hand, that it is a disease of civilization; that the aberrant cells scattered through the body are stimulated to abnormal development of a malignant type by toxins in the blood; that these toxins are varied in nature; that many of the toxins are due to metabolic and dietetic errors, particularly in regard to proteids; that overeating, the consumption of tea and alcoholic beverages and the nerve strain of modern life play their part directly or indirectly as abnormal stimulants on morbidly deranged cells. As a result of these he believes that much depends upon prophylaxis in the cancer campaign, and seems to lay most stress upon a rigid vegetarian diet. The other factor, principally concerned, looks to an elimination of those errors of living attendant upon civilization. The book offers no proof; it puts forth argument, statistics and the result of the author's experience, and the value of his theory must be judged by each individual reader.

**BEITRAEGE ZUR KLINIK DER INFEKTIONSKRANKHEITEN UND ZUR IMMUNITAETS-FORSCHUNG (MIT AUSSCHLUSS DER TUBERKULOSE).** Herausgegeben von Professor Dr. L. Brauer, Aerztlichem Direktor des Allgemeinen Krankenhauses Hamburg-Eppendorf. II. Band. 3 Heft. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, 6 m.

A number of studies of the epidemic of cholera that broke out in the Bulgarian army during the Balkan war have been published. The cases at Sofia itself, where the writer of the first contribution of the journal was stationed during the war, were far less numerous, but on the other hand admitted of more detailed study. In his analysis of the cases observed there, Hesse has presented a real contribution to our knowledge of Asiatic cholera.

Other articles in this interesting number are by Bauereisen on gynecologic bacteriology and Klimenke on repeated injections of antitoxin. On account of the danger of anaphylaxis, the latter advises against the intravenous and epidural injection of antitoxin.

**THE QUESTION OF ALCOHOL.** By Edward Huntington Williams, M. D., Formerly Associate Professor of Pathology, State University of Iowa, etc. etc. New York: The Goodhue Company. 1914.

This is an eminently sane review of the alcohol question. The per capita consumption of alcohol in the United States has increased from 4.08 gallons in 1850 to over 23 gallons in 1913. Moreover this has been a steady gain, year by year, in spite of strenuous efforts to meet the danger. Prohibition has proved a failure, because it hardly ever prohibits. The most promising solution of the problem lies in the recognition that the saloon is the poor man's club and can be best fought by the creation of still more attractive non-alcoholic clubs, especially if equipped with gymnasia. To this should be added forcible institutional treatment of habitual inebriates and prevention of the sale of liquor to adolescents.

**A MANUAL OF PHYSIOLOGY. With Practical Exercises.** By G. N. Stewart, M. A., D. Sc., M. D. Edin., D. P. H. Camb., Professor of Experimental Medicine in Western Reserve University, etc. etc. With Coloured Plate and 467 Other Illustrations. Seventh Edition. New York: William Wood and Company. 1914. Price, \$4.00.

That Stewart's "Physiology" has met with the approval of teachers of this subject is indicated by its appearance in a seventh edition. The large amount



of space devoted to description of experiments and apparatus renders it more suitable for a laboratory companion to the medical student than as a book of reference to the practitioner. Thin paper, rather fine print and a concise style have enabled the author to include a vast deal of information within the compass of a moderate-sized book.

**NUTRITION.** *A Guide to Food and Dieting.* By Charles E. Sohn, F. I. C., F. C. S., Membr. Soc. Public Analysts, etc. etc. New York: E. B. Treat and Company. 1914. Price, \$1.75.

Sohn's "Nutrition" furnishes an excellent supplement to our best textbooks on dietetics, being weakest where they are strong and vice versa. The introductory chapters on the anatomic and physiologic bases of the subject have a negligible value; his discussion of the chemistry, dietetic value and modes of preparation of the various foods is easily the best presentation of the matter in the English language. The chapters on the cereal foods are especially interesting and instructive.

**CHEMISTRY AND TOXICOLOGY FOR NURSES.** By Philip Asher, Ph. G., M. D., Dean and Professor of Chemistry at the New Orleans College of Pharmacy, New Orleans. Philadelphia: W. B. Saunders and Company. 1914. Price, \$1.25.

The need for a book of this sort is doubtful, to say the last. It presents, in most arid fashion, the bare skeleton of chemical facts, from the atomic weights of the metals to the rational formula of the mercaptols. To set a poor, hard-working nurse to work chewing such Dead Sea fruit would be cruelty indeed.

**UEBER DEN EINFLUSS PHYSIKALISCHER MASSNAHMEN AUF DEN KREISLAUF (UND DIE BLUTVERTEILUNG).** Von Professor Dr. Alexander Strubell, Dresden. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, m. 85.

This is an address delivered at the 34th Balneologic Congress at Berlin in 1913. The essayist points out that the cardiac function may be influenced by physical factors in three ways:—

1. By means of a change in the total volume of the blood.
2. By means of an alteration in the activity of the two cardiac pumps.
3. By changes in peripheral resistance.

A diminution in the mass of blood is secured either by limiting the amount of fluid intake or by means of venesection. The second and third changes are produced reflexly through the vagus, accelerator and vasomotor system and from the chief field of modern physical therapy. A clear and concise presentation of our knowledge, as yet rather limited, in this field may be found in Prof. Strubell's little monograph.

**CLINIQUE ET THERAPEUTIQUE CIRCULATOIRES.** Par Le Dr. Alfred Martinet. Paris: Masson et Cie. 1914. Price, 12 fr.

This is a book of very great merit and not inconsiderable faults. In it the reader will find just what is lacking in most textbooks on diseases of the circulation, a careful and systematic description of all of those methods of precision that are making the study of heart disease almost a separate discipline. The graphic methods, the analytic methods, all the attempts to estimate cardiac and renal functions quantitatively are described clearly and in detail. We know of no book in the English language to compare with it in this respect. In the more general clinical discussion of the subject, however, the book is not nearly so strong and most of us would consider its therapeutics still less satisfactory. Still the volume usefully supplements our best textbooks.

**DIE DYNAMISCHE PULSUNTERSUCHUNG.** Von Dr. Med. et Phil. Th. Christen, Privatdozent der Universitaet Bern. Mit 72 Abbildungen. Leipzig: Verlag von F. C. W. Vogel. 1914. Price, 10 m.

If it were possible to determine the actual work done by the heart, a great step forward would be taken in the direction of functional cardiac diagnosis. As yet, no such method has been discovered. The nearest thing to it is Christen's method of measuring the work of the pulse, a very different matter and yet one that promises to be of considerable clinical value. In his monograph he discusses in detail the mechanics of his invention, a matter of some complexity, as well as its practical utilization. The book is indispensable for any one who plans to work with Christen's energometer.



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## EDITORIAL.

### MIDDLE-AGE SPREAD.

Let us suppose that you have pursued the game of golf in the afternoon and let us suppose that you have flung out your arms in all directions, have bent your body forwards and backwards, and have made each of your mornings a very active one, indeed. And let us suppose that you have attended to your diet in such manner that only the leanest meats have been consumed, the carbohydrates and fats shunned, and all alcoholic drinks consigned to a vault that refuses to open its door to your most earnest and heartrending appeals. And let us suppose that you are fifty. No doubt you are very serious when you undergo your many exercises, serious as to their performance, and what is better hopeful as to the glorious results. Your friends who hear that you have become a disciple of outdoor sports and indoor physical culture will compliment you on your improved appearance, will pat you on the back in the way of encouragement, and will remark with special emphasis that your waist has marvelously contracted. The latter remark will please you most of all, for by feeding this delusion you will arrive at a beatific state, that is you will imagine that youth is returning. No matter how much thinner you get around the chest, around the neck or around the legs, if your abdomen continues to protrude, your exercises, in your opinion, have come to naught, for are you not declaring to a scrutinizing world that you are still middle-aged? Now it is not our intention to belittle exercise, or for a moment to commend a sedentary life to one that is dedicated to gymnastics, but what we wish to impress upon you is the fact that Nature has so arranged matters in this imperfect world that with the oncoming of years all of us must perforce entertain middle-age spread. Not only does this affect our bodies but also our minds, and it would be well for all enthusiasts in the matter of physical culture to know this. Of course, just because you cannot ward off middle-age spread is no reason for your giving up all exercise, but it is a reason, and a very good one, too, not to believe your friends when they tell you that you have not only taken off ten

pounds of flesh but are ten years younger in appearance. To combat this untruth and to make all those, who are enthusiastically following physical exercise in the hope of outwitting Nature, aware of just how far their endeavors will carry them, we are printing below a brilliant essay, from a recent number of the London *Outlook*, by Mr. Filson Young, the English writer, who though not a medical man has certain sanities which, alas! appear altogether too seldom in the books which doctors write on the prevention of the disagreeable and annoying phenomena of the post-meridian of one's life:—

There are tragedies that can be sung and acted; there are tragedies that can be spoken and read; and there are others that cannot be uttered, but are silently performed with shut doors in the mirrored secrecy of the soul. Here the solitary actor is also the spectator; it is the essence of the tragedy; for were an audience to be admitted the tragedy would in nine cases out of ten cease to be a tragedy and become a comedy or a farce. The solitary actor does not know this; and he goes on wringing his own heart with his performance, and (if the truth be told) nourishing a false sense of dramatic values. For pain and grief are solitary possessions; in so far as they are not or cannot be shared they sting and hurt, and in so far as they are shared they become inevitably dispersed and diluted, or perchance transformed and ennobled.

Among these secret tragedies few are more poignant than those connected with what is too often regarded as the doleful business of growing old. If growing old be really a tragedy, then is the whole of life a tragedy; the bursting of a seed-pod and the breaking of a blossom are tragedies, and the whole affair of existence an unmitigated evil. But this is not true; and since the whole of life consists in growing old, since it is a process that begins from the cradle or the March seedfield, it is clearly something which is to be regarded as an essential part of life itself. I feel sure that on the whole the tragic view of life is the wrong one—if only because it makes life unbearable, and for an immense majority of people life is not only bearable, but extremely interesting and worth while. Although, however, one may be convinced that this is an obvious truth it does not reconcile us to the process of growing old ourselves. We may see it as a beautiful development in other people, as a mellowing and ripening process; but we are not a little shocked when we begin to realize quite clearly that it is also happening to ourselves. The thought that we can never be young again is a sad thought; but it is nothing to the realization of the first moment when other people, whom we look upon as belonging more or less to our own generation, give clear evidence that they regard us in quite another light, and treat us either with the respect or the neglect that youth habitually accords to those who have passed the meridian of life. Again, the ageing of a beautiful woman is always something of a tragedy to herself; and yet it is so obvious, it excites so much sympathy, that it can hardly be regarded as a secret tragedy, and so loses something of its bitterness. The real tragedy exists in the case of some plain man, the loss of whose youth can make little difference to his friends, since it carries no very obvious disabilities with it, when he first realizes that in face and in figure he no longer looks like a young man.

For there is at first something quite absurd and incredible in the idea that this business of growing old can touch oneself. Most of us think of ourselves as being younger than we really are. There is, for example, such a thing as being thirty-seven. In a general way I should describe a man of thirty-seven as being in the full maturity of life, properly interested in grave matters, a vehicle of affairs, and bearer of responsibilities. Now technically and by the calendar I am thirty-seven; but I cannot help feeling that the figures are extremely misleading in my case. I feel very much as I did when I was twenty-seven; and then I felt the same as I did when I was twenty-four. I am not entirely preoccupied with the graver sides of life; I often secretly long to share the amusements of children; my shoulders seem to me unsuitable for heavy responsibilities; it would be better, I think, to wait until I am more like what other people are when they are thirty-seven. I have still the sense that there is a long time yet in which to do the greatest and most serious things that I wish to do. When I am forty, I think, would be a good time to begin. Once I am forty it seems to me there will be no getting away from the fact, and I shall be willing to rank myself with the middle-aged. But I know that it is not true—that when I am forty I shall feel very much the same, and look upon fifty as a suitable age at which to take a more sober view of life. Imagine, then, with what a shock it must come to me to find that I am obviously regarded by many people as a sober middle-aged person, one who will obviously prefer to sit with the elders, and who would be bored and mystified by the high-spirited doings of young people. With my contemporaries I feel I am acting a part—that I am only pretending, and pretending badly, to be a person with experience behind him; I am always afraid of being found out. And yet when I am with my contemporaries of twenty-six it is only I who am quite at ease, and I perceive a tendency on their part to talk to me in a way that they think will interest me, deferring the more natural expression of themselves until I have left the room. I feel too young for the contemporaries of my age, and too old for the contemporaries of my spirit.

The other day my tailor informed me that the measurements round my hips and my chest (I am glad it was not only the hips) had increased one inch since last they were taken. The dog actually laughed, and thought that the news would interest and amuse me. When he saw that I clearly regarded it as a disaster he hastened to reassure me, saying, with a geniality for which I could have whipped him, "Why, sir, that's nothing at all; it's only middle-age spread." Middle-age! How dared he use such an expression to me? It rankled in my mind like a clumsy and ignorant affront until, on soberly considering the matter, I realized that I had not only reached but had actually passed middle age, and that in the probable anticipation of life the years that remained to me must be less than the years that are gone. I know that this is a fact; I have earnestly tried to realize it, and have quite genuinely failed to do so. It means nothing to me. My brain receives the fact and automatically checks the logic of it, but I do not receive it with my whole intelligence. There must be a mistake; I must be an exception; and though it is on record that I was born in the year 1876 it is quite clear that my years have been shorter than other people's, that there must have been some group of years which went by at lightning



speed, which became fused in the heat of passage and melted into one, and that the next decade will proceed at a much more reasonable pace.

There is no tragedy here, you see, because (for I think my experience is not an exception) we do not readily apply the fact of age to ourselves. But the Middle-age Spread is another matter. There is no getting away from the tailor and his tape. There is the fact; and to go back to the tragedy of the plain man who was never valued for his beauty, and whom a touch of obesity cannot really depreciate, there is the real inner tragedy the moment when he looks in the glass and realizes that his figure and his countenance are assuming a more fleshly habit. It may be desirable that we should see ourselves as others see us; but we wish also that other people could sometimes have the advantage of seeing us as we see ourselves. We look upon our image in the glass as no other eye looks upon us. No one may have noticed the youth and facial proportions of the plain man of my instance, but he noticed them; his face was interesting to himself, if to no one else; and the appearance of curves where once had been straight lines, and the rounding of what were once clean angles, is tragic to him; it is a tragedy which he can share with no one else. It is dreadful to him to see flesh where once he saw spirit, and to realize that he is well on the way to old age. For although, as I said, growing old is a constant process which begins at the moment of birth, it is one of which we are not continuously aware. There are times in youth when growing is painful and troubling, and a time in age when it is melancholy and solemnizing. But there are long stretches in between when we are not very conscious of it, and for most men at any rate the years between twenty and thirty bring with them little sense of growing old. Time is a stream that is always flowing, but where it is broad and deep we hardly notice the current; and we entertain ourselves on its shore, watching others floating by on the tide, until the moment comes when the current gets us too, and we realize that it is bearing us away. And for many people this moment is the moment when they first become aware of Middle-age Spread.

It is a pregnant moment—almost, I think, the last great deciding moment in one's life. One must decide either to fight it or acquiesce. It is now, if ever, that we need to make a call upon our remaining youth, to summon it to our assistance. We may or may not decide to fight the spread of the body; we may or may not run to dietists and doctors and indulge in violent exercises. Whether that is worth while or not is largely a matter of individual circumstance; but what we must see to is that the spread of the body does not communicate itself to the mind, and result in a fatuous acquiescence in our destinies. . . . So I would say to all who are beginning mentally or physically to spread: Have patience with the new generation; be interested in and curious about them; do not laugh their futurism and cubism entirely out of court; if it is nothing itself it means something; there is something behind it; there is your own lost youth behind it. Have patience with them, encourage them, and above all do not lose touch with them; lest haply even the current which bears you along discards you and leaves you floating in some backwater, spreading, and spreading, and spreading.

## ORIGINAL ARTICLES.

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### THE CONDITIONAL REFLEX OF PAWLOW.\*

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When Ivan Petrovitch Pawlow completed twenty-five years of labor in physiological research there appeared in his honor a *Festschrift* written by his pupils and admirers. When it is stated that such eminent scientists as Tigerstedt, Cohnheim, Boas, Gley, Waller, Schafer, Bayliss and DeCyon each added a paper to those of his pupils it will be seen that Pawlow then stood high in the opinion of the foremost research workers of three nations. Later there came to him the Nobel prize in medicine, placing him in the company of Metchnikoff, von Behring, Ehrlich, Cajal, Carrel and other great workers of medicine. These familiar bits of personal history are given to emphasize the deplorable fact that Pawlow's work has made practically no impression on American medicine. The only two authoritative papers on the subject are those written by Sergius Morgulis, a Russian by birth and education, a biologist of American training. American neurology has neither added the concepts of Pawlow to its theory nor applied his facts to its practice. It is for the purpose of directing attention to what should be familiar work that this review is written.

The great contribution of Pawlow, and one elaborated with almost unbelievable method and thoroughness by himself and his pupils, is the conception of the conditioned (or properly conditional) reflex. In a measure, Pawlow's work<sup>1</sup> is comparable and supplementary to Sherrington's work on the integrative action of the nervous system. Sherrington conceives the organism to be a mass of cells, a collection of organs kept as a unit largely by the interacting reflexes and inhibitions of the nervous system, and places as the critical point, where changes occur either for stimulation or inhibition, the hypothetical synapse. For Pawlow, the point

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of view is a developmental one, a post-uterine, ontogenetic one. He sees the organism which is to be subjected to the play of environmental factors starting out with a few innate, unconditioned reflexes, and building up from these, as a result of the interplay between its forces and those of the environment, an immense number of the so-called conditioned reflexes. These latter manifest themselves in the adaptive conduct of the animal. The one's (Sherrington's) experiments and contributions study the adult nervous mechanism working in an integrative manner against a disintegrative and stimulating environment. The other, Pawlow, shows how the simple, unconditioned conduct grows and develops into complex, conditioned conduct.

Taking up the work of Pawlow we find in his writings, especially those which have appeared in English, French, and German, an immense number of facts based upon experiments entangled and intermingled with his theories. It will, therefore, perhaps lend to a clearer understanding of the subject if at first we confine ourselves to a study of the methods and results, and later take up the theories which evidently have resulted.

First, as to the method. This originated in his work on the dog's salivary glands carried on to further our knowledge of digestion, for it is pertinent to remark that Pawlow was a famous physiologist long before he took up the studies which have brought him into neurological and psychological fields. Fortunately, despite the numerous experiments that Pawlow and his pupils have performed, the method has remained remarkably constant and simple throughout.

"Upon a healthy dog whose salivary flow is copious and normal the simple operation of making a salivary fistula is performed. The fistula is then so connected that the salivary flow, recorded in drops is, in reality, measured most accurately. This is done by either of two methods,—a manometer several feet long is connected to a small air chamber into which the saliva flows and the amount is measured by the displacement of the meniscus. The manometer is calibrated with drops of a standard size causing a displacement so extensive as to enable very precise measurement. The other method consists of an electrical device. The saliva flows through a capillary tube and the drop, forming at the out-going end of the tube as it falls through a somewhat wider channel, strikes two platinum wires making a contact which is marked on a smoked drum. The time is likewise recorded automatically. In either case the recording apparatus is outside and is inspected without disturbing the animal.

"In fact, the construction of the laboratory is such that no vibrations of any kind can affect it. The animals, during the experiment, are placed in separate compartments enclosed by walls com-



posed of several layers which make them absolutely vibration and sound proof. The experimenter is invariably (except when he himself is to be a stimulus) outside the compartment, and the entire experiment is conducted by automatic arrangements. The stimuli are produced from the outside and the food is also dropped into a dish in front of the animal from a suspended box which opens and closes by a compressed air apparatus operated by the experimenter."<sup>2</sup> The construction of the laboratory is of very high importance in the successful outcome of the experiments and represents the experience gained by Pawlow during years of work, although it must be stated that the fundamental results were obtained in a far less perfect laboratory than the one described.

There are two sets of reflex phenomena as demonstrated by the salivary flow of the dog. First, there is a reflex secretion that follows the placing of food or dilute acid within the mouth of the animal. This is dependent upon the direct chemical and tactile stimulation of nerve endings within the mouth. It is innate and invariable and needs no other conditions except those coming from the stimulus and an intact innate nervous mechanism. This is then called the absolute or unconditioned reflex and the stimulus is an unconditioned stimulus.

Second, there is a reflex secretion that depends for its genesis upon the coincidence in time or some other stimulus with the unconditioned stimulus; for example, a sound, a color, a skin stimulation is given simultaneously with the stimulation by food. With repetition this hitherto indifferent stimulus becomes in itself and by itself effective in starting secretion.

These latter, the conditioned reflexes, form the starting point of Pawlow's physiology of the nervous system, a something which really includes that which most people call psychology. It is necessary to study these responses in more detail before going on to their theoretical explanation and practical application.

*First*, it is a critical point and one much emphasized by Pawlow that *anything* in the environment may be made to act as a conditioned stimulus in starting up a conditioned reflex secretion of the salivary glands.<sup>3</sup> This point Pawlow regards as of prime importance in his theories and conclusions. Visual, auditory, olfactory, tactile, temperature stimuli, or, in terms of the environment, sights, shadows, sounds, voices, footsteps, odors, heat, cold, pain, the enemy, all, no matter how indifferent originally they are, as stimuli for the secretion of saliva may, by the proper technique, be used to start a conditioned salivary reflex, merely by coinciding them for some time with the unconditioned stimulus; that is, food or dilute hydrochloric. An extreme and startling demonstration of this fact is the experiment which proves that even pain may be so used.<sup>4</sup> A powerful and painful galvanic current, though in itself

causing a reaction of defense, may be caused regularly to start up the salivary secretion; that is, to be the stimuli for a conditioned reflex. Moreover, if the reflex has been established to this painful stimulation, increasing its intensity increases the salivary flow. Further, while this pain-conditioned reflex may be formed from real food as the unconditioned stimulus, it cannot be formed to dilute hydrochloric, though the latter is an excellent unconditioned stimulus for the most of auditory reflexes.

Pawlow makes the startling statement that Time itself is a conditioned stimulus. This seems a rather iconoclastic statement until the experiment giving rise to the statement is cited. "By stimulating the gland with food at strictly regular intervals a specific salivation reaction may be formed on a time basis"; that is to say, there will after a time occur a periodic reaction of the salivary glands without any feeding, and from this, Time is taken to be a conditioned stimulus. "A conditioned reflex thus established resembles exactly other conditioned reflexes. It is not very stable, however, and wanes somewhat after the first failure of re-enforcement by the unconditioned stimulus. The nervous system is capable of very minute differentiation of time and the twenty-ninth minute is clearly distinguished from the thirtieth in a thirty-minute period."<sup>5</sup>

*Second*, not only does the organism learn to respond regularly to these conditioned stimuli but learns to discriminate very finely between similar stimuli. For example, if a conditioned salivary reflex has been formed to a sound of one thousand vibrations per second, the organism will not respond to an auditory stimulus of the same nature but of one thousand twelve vibrations. In other words, the nervous system differentiates between the two sounds, the arcs of the reflex mechanism become set for a certain sound stimulus, and up to a certain minimum of difference will react to no other. This differentiation, however, is not obtainable at first, for then there is a general affectivity established for stimuli of similar nature. It is only later that differentiation occurs. This fact is the basis of experiments which seek to discover the powers of sense discrimination of animals and which have added a noteworthy chapter to the study of animal behavior; for example, the dog is thus found to be an animal with an olfactory range and discrimination far finer than man's, as is also true in a lesser degree of his auditory powers. His color sense seems absent while his visual discrimination in general is below par. This power of differentiation stands in intimate relation to inhibition, a relationship, however, which will be considered later on.

Certain curious facts concerning the conditioned reflexes which are originated in stimulation of the surface can here be mentioned. When cold is applied to a given area under the proper technique for

forming a conditioned reflex, there is developed after repeated efforts a conditioned reflex so that stimulation of this particular area will in itself cause a salivary secretion. Not only has the area so trained become potent, but now without long training any skin area of stimulation is as efficacious. In other words, the training, though local, has had a general effect. While the same is true of heat, a totally different condition of affairs prevails with regard to mechanical or tactile stimulation. If such a stimulus is applied to any area after a time, that area becomes responsive. But if another area which has not been made the site of a conditioned reflex be stimulated simultaneously with the area from which the conditioned reflex is now obtainable, no response at all will follow. In other words, the response is inhibited. Thus, heat or cold locally applied alter reflex activity in a positive direction throughout the entire skin area; that is, they act as general stimuli no matter if locally applied. On the other hand, tactile, mechanical stimulation is locally stimulatory but generally inhibitory, so that it is a more particular, more differentiated stimulus, or rather relates to a more definite, highly specialized and differentiated mechanism. Such a difference between these two kinds of stimulation may be of high importance in therapeutics.<sup>6</sup>

Turning now to the experiments conducted for the study of inhibition, we find a large number of facts which are conveniently arranged as follows: A certain series of inhibitions arise from interference by outside stimuli. Continually the environment, according to Pawlow, is pouring in sights, sounds, odors, etc., which act as orientation stimuli; that is to say, the animal orients itself to them. As a result any conditional reflex attempted at the same time is inhibited.<sup>7</sup> "Before the extraordinary exigency of the external environment, the other activity presented needs must give way provisionally. This inhibition constitutes a considerable obstacle for research into the different aspects of our fundamental phenomenon, (*i. e.*, the conditional reflex), and may thereby render its appearance extremely difficult or entirely block it."<sup>8</sup> But any new stimulus thus appearing from the environment, if it becomes regular and familiar, soon becomes indifferent and has no effect upon the conditioned reflex. To this type of inhibition Pawlow has applied the term 'extinguisher.'

Another type of external inhibition comes from stimuli arising at the central organ from other parts of the body; for example, a full bladder or a distended bowel may entirely negative a conditioned reflex.

These two examples of external inhibition may well be followed by consideration of the type known as internal inhibition. This is a rapid but only temporary paralysis of conditioned reflexes. An important type is the dropping out of the conditioned reflex,



which occurs whenever it is for any extensive period continued without the unconditioned stimulus, the food. That is to say, if, for example, a skin stimulus which has been brought to the point where it is a conditioned reflex for saliva is repeatedly used to bring a flow without the animal being given food, it becomes, after a time, inoperative. This is explained by Pawlow<sup>9</sup> by the statement that such a conditioned reflex is adjusting the organism falsely by preparing it for food which does not come. Consequently, the reflex is inhibited, but may, however, be promptly restored by feeding. Another type of internal inhibition is when a neutral agent or stimulus is coincidentally given with the conditioned stimulus, without the unconditioned stimulus.<sup>10</sup> For example, if a sound is used to bring a conditioned reflex, the addition of some neutral visual stimulus, such as a light, brings about a gradual inhibition. But if this is repeatedly used, it gains in power until the inhibition becomes instantaneous. Moreover, if the neutral agent, the light, for example, now be used with any other conditioned stimulus, it brings about inhibition at once. This leads Pawlow to the conclusion that this inhibition is comparable to a conditioned reflex, and, therefore, he calls it a conditioned inhibition. Moreover, to show the intricacy of inhibition and the possibilities of experimentation, he shows that inhibition itself may be inhibited. If a conditioned reflex, say to a one-thousand-to-the-second tuning-fork is allowed to act without the unconditional stimulus, food, internal inhibition finally checks it, as has been described above. Now, if there is added a neutral stimulus, an electric light, which, by itself, causes no conditioned reflex, the salivary flow is again established.<sup>11</sup> Comparing the primary internal inhibition to a locking, Pawlow calls this new phenomenon, at least in the French translation, a '*désenrayment*,' an unlocking, a term which, in the German translation, is called '*loshemmung*,' and which to me seems adequately translated in the English by the term 'release' of the conditioned reflex.

Two more important series of experiments claim our attention before we can proceed to the consideration of Pawlow's theories. The first concerns sleep. Early in Pawlow's work an annoying phenomenon was noted. It was that the animal under certain conditions became very drowsy and no experimentation could succeed because of the dog's torpor. Particularly it was noted that the application of heat made the animal drowsy. Later on, when this phenomenon was studied more closely, it was found that the dog could be regularly put to sleep by stimulating some area with heat, at the same time that dilute acid was placed in its mouth. Further, before sleep came on, the animal took poses and attitudes strikingly like that of the cataleptic and catatonic. Finally, Rojanski,<sup>12</sup> one of Pawlow's pupils, working in his laboratory, made the phenomenon of sleep the subject of a prolonged study. He used as the objective

indicator of sleep the muscular relaxation and the reaction to outside influences. "The depth of sleep," he says, "is measured by the degree of muscular relaxation which is determined by an instrument devised by the author. The disappearance of the conditioned reflexes is ascribed to the development of inhibition. Mechanical interference with bodily movements acts as a hypnotic influence, and it is believed that spontaneous sleep likewise has origin in the inhibition of movement. Correspondingly, stimuli affecting the muscular system are most potent in disturbing sleep. Stimuli originated in the urinary bladder or in the large intestine, both of which are associated with the motor system, are very effective agents in disturbing sleep. . . . The physiological source of sleep is the inhibition developing within the motor analyser. . . . Active animals were strapped to the boards so they could not move a limb. The animal thus forced to become absolutely quiet . . . soon falls asleep in this environment. The environment becomes a conditioned inhibition. Every time the dog is placed in the stand and strapped, established conditioned reflexes fail to appear," since the animal falls asleep. Sleep, then, is a conditioned inhibition.

Of equal importance and interest to this experiment on sleep are those on the influence of excitement and emotion upon the conditioned reflexes. It may be stated that excitement occasioned by almost anything may overcome inhibition and release a conditioned reflex. A most interesting experiment is recounted by Pawlow.<sup>13</sup> A watch-dog with a thoroughly developed 'attack reflex,' upon whom the experiments were being made, is confronted by a stranger who enters the laboratory and makes aggressive and threatening movements. Immediately the salivary flow in response to an established conditioned reflex attempted by the stranger becomes very much increased, as the animal becomes exceedingly excited and angry. When the stranger quiets down and assumes a more conciliatory attitude, the dog likewise gradually becomes quiet, and then it is found that the salivary flow becomes markedly diminished and almost entirely disappears. Should, however, the stranger resume his threatening attitude or arouse again the hostility of the dog, the conditioned salivary reflex becomes again strong, and a copious salivary flow is established. That is to say, a strong emotion, (for Pawlow, the attacking reflex), here accelerates the action of a conditioned reflex, though it might have been expected that it would check it.

We come now to the consideration of those theories, which Pawlow has developed from these and other experiments, to be recounted as we proceed. It is natural, of course, that given a man starting work as a pure physiologist and drifting gradually into neurology and psychology, his view will have undergone a continuous evolution. They are given here as they now stand. First

of all, he is very firm in his belief that psychological problems must be attacked in an objective manner, especially so far as the animal is concerned. We must not intrude, says Pawlow, our ideas concerning human emotions, human will and intellect, into the interpreting of animal conduct. He is a behaviorist *par excellence* and rejects as fatal to natural science anything other than its usual objective methods. For him, psychology can only be removed from the tainting influence of metaphysics, from the clinging hampering imports of philosophy by discarding entirely their methods.

With that as his first condition he considers the animal organism as a unit that maintains itself against the environment. Its reactions can best be studied by pouring, as it were, into that organism, selected bits of the environment, just as a chemist takes an unknown substance and tests its reactions to chemicals. Indeed for Pawlow a chemical molecule maintains itself against the environment—that is to say, maintains its form and chemical nature—by internal powers and resistances and in that respect can be well compared to the organism. Though he in no place distinctly says so, it is evident that Pawlow is a materialist and this philosophical belief enters very largely into his neurology and psychology.<sup>14</sup>

He considers then the environment and organism as acting and reacting on each other. Certain of the reactions of the organism are innate. They are absolute, they are invariable. These are his unconditioned reflexes and they form the basis by which the organism builds up its complex reactions. These complex reactions we have considered under the heading of the conditioned reflexes, and for Pawlow the final study of conditioned reflexes will be the final study of the sum-total of psychology. The conditioned reflexes then form the basis of the higher functions and reactions and their mechanism needs consideration.

There are two distinct mechanisms by which the higher functions are elaborated. First, there is the mechanism of temporal relationship. That is to say, with an environment so complex, so shifting, so changing and renewing as is the environment in which every higher animal lives, the organism must enter into relations with it that are of necessity temporary,—passing sounds and passing odors, passing sights and passing contacts give direction to the organism for those things which it must have and those things which it must avoid. Especially for the things it must have it must enter into temporary relationship with the environment because, *e. g.*, food is now in one place and then in another. How does it enter into relationship with this changing environment? Every new stimulus reaching the organism may, if the conditions be right, take possession of the old mechanism or innate reflex (the final common path of Sherrington), and by so doing builds up a conditioned reflex. *If the new excitant finds in the central nervous*



*system a locus of existing excitement of an intense kind, that is to say, excitement started by an unconditioned stimulus, it commences then to concentrate and find its way to that locus, and therein is created a conditioned reflex. If there is no locus of excitement it dissipates itself without results. That for Pawlow is the fundamental law of the superior or higher centres.*

Pawlow considers at this point the question, Are these phenomena to be considered reflexes? Why not label them psychic phenomena, just as did the old psychologist when he considered the secretion of saliva by the dog at the sight of food. He brings against this the following arguments. First, any outside agent may be made the basis of a conditioned reflex. Second, he does not find any essential difference in the excitation which pours in by the eye or the ear or the smell, and the excitation which pours in by the mouth so far as psychic qualities are concerned. Both kinds are either psychic or reflex. Third, the certainty of results, provided the technique is correct, gives the reflex character, and finally the whole basis of his neurology and psychology is that the *reaction* must be considered and *not any internal or attendant feeling*.

As an example of a complex conditioned reflex, Pawlow<sup>15</sup> gives our perception of the real size of an object. He says there must have occurred simultaneously the stimulation from the retina, the stimulation from the ocular muscles, as unconditioned stimuli, and the conditioned stimulation of the tactile sensations of the object itself. These three things are necessary for perception of size and arose first through coincidence.

The second mechanism which Pawlow finds is necessary for explanation of the action of the higher centres, especially in so far as the conditioned reflex is concerned, is the analyser. This is a mechanism for taking apart the environment. With an environment which pours in upon the individual a manifold of sights, sounds, odors, tactile sensations of all kinds, and a body likewise which pours in upon a central organ friction of joint surfaces, tensions of muscles, etc., there is necessary a mechanism which will isolate the sensations so that the individual may understand his environment and the condition of the motor apparatus. This analyser includes the receptor organs, that is, the eye, the ear, the skin, etc., and the afferent nerve fibers together with the central cell located either in lower or higher centres of the brain. In other words, he adds to what most people would consider the analyser, the afferent nerve and the nerve cell.

For Pawlow, the essential law of analysis or the fractioning of the outside world (a phrase of his) is the gradation of analysis.<sup>16</sup> This needs explanation. At first the analyser is put into general activity by a stimulus and the excitation radiates widely. Later on, the response becomes gradually differentiated because only a

certain part of the analyser responds. For example, when an illuminated figure is used as the source of a conditioned reflex it is the light or general character first which is the excitant. Later on the details of the figure commence to act, and finally the specific character of the stimulus alone excites a response. This is the gradation process by which the differentiation occurs so that the organism responds more finely and fitly. This gradation is brought about by inhibition, by the production of that which is essentially a torpor of all the analyser except the specific part involved. This progressive differentiation is dependent upon the progressive establishment and re-establishment of equilibrium between the excitation process and the inhibiting process. This equilibrium can be broken, as, for example, by giving caffeine which, as is well known, stimulates the excitation processes. As a result of the administration of this drug, Pawlow states that an animal which has built up highly differentiated conditioned reflexes loses, first of all, the ability to differentiate. That is to say, instead of reacting to specific characters of the stimulus, the animal reacts to the general characters and finally the reflex becomes very coarse. Such facts as these, it seems to me, may have decided value in our understanding of the mechanism whereby alcohol destroys inhibition and whereby even processes like paresis affect the personality.

Experiments on analysers have been made by extirpating portions of the cortex. The more seriously injured a centre becomes, the more gross becomes the differentiation. For Morgulis,<sup>17</sup> this fact points towards the elimination of the old idea of psychic centres, as, for example, the centre for psychic vision. The experiment of Munk wherein he injured the calcarine portion of the occipital lobe and thereby brought about a condition of affairs in which the dog, though he saw, could not comprehend what he saw, is accounted for by Pawlow, as interpreted by Morgulis, by a mere destruction or injury of analysers. With the analyser destroyed the conditioned reflex becomes more coarse. Instead of the animal responding to highly differentiated parts of the stimulus, he responds only to the coarser elements in it, for example, the light and the shade rather than the form and minutiae of the object. There should not then arise any question of psychic centres at all. *Such loss as we call psychic is merely the dropping out of the power of fine discrimination by injury to the analyser.*

For Pawlow then the main laws which govern the nervous system and its actions are excitation which first is general and then gradually becomes differentiated through the second fundamental process, inhibition. Inhibition becomes more and more refined and active the more highly differentiated a conditioned reflex is, and then finally there is the releasing of reflexes through inhibition of inhibition, which is the most refined phenomenon of the higher centres.

These laws manifest themselves in the conditioned reflex which for Pawlow is the probable basis of all activity.

In criticism of the foregoing theories which constitute the major ideas of Pawlow in regard to the conditioned reflex, the following must be stated. (1) Pawlow is to a very large extent attacking a much dilapidated straw-man. Psychology has long since incorporated the laboratory into its methods. There is a well-grounded and very well-developed school of experimental psychology which aims to be objective. All universities which pretend to teach psychology at all have adopted the method of natural science in so far as it is possible in dealing with humans in their study of psychology. Concerning the study of animals, there is a journal entitled *The Journal of Animal Behavior*, which fact alone indicates the trend of thought regarding methods for studying animal psychology. Moreover, it is a rather grave defect of Pawlow's work that he pays very little attention to the work done in experimental neurology during the last thirty years. It would almost seem that he has not heard of Luciana, Horsley, Lewandowsky, Oppenheim, Sherrington, and a host of lesser lights. All his conceptions concerning the play of the environment upon the individual organism and the reactions of that organism are very beautifully studied in Sherrington's "Integrative Action of the Nervous System."

(2) The above criticism, however, is not essential since it does not touch in any way his theories. A more pertinent observation is that there is no such absolute difference between the conditioned and the unconditioned reflexes as that which Pawlow makes. In the first place, the unconditioned reflex is by no means innate in man. Even such phenomena as the knee-jerk and the ankle-jerk are developed after birth. There may be an innate power of developing such responses, but that is as much as can be said. For a more pertinent example, the saliva is not secreted with any regularity until quite late in infant life. In the second place, the unconditioned reflex is not invariable even when fully developed, since it may be inhibited. For example, emotion may inhibit the flow of the saliva even with food, the unconditioned stimulus, in the mouth, or, to put it in terms of objective psychology, a group of outward events may prevent the action of the unconditioned stimulus. In that respect the unconditioned reflex is like the conditioned one. In the third place, the unconditioned reflex is as much a response to the environment as the conditioned. The only difference is that the unconditioned reflex is a response to the immediate environment rather than the distant, a piece of food in the mouth rather than a sight or a sound. Pawlow himself, however, has pointed out that there is no essential difference between such excitation.

(3) Moreover, it would seem impossible for conditioned reflexes



to arise by the mere coincidence in time of conditioned stimuli with the unconditioned stimulus. Imagine a dog pouring out its saliva or its gastric juices merely because some sound or sight happened to occur for a few times while it had food in its mouth, which, according to Pawlow, is the essential mechanism for the conditioned reflex. This would be a thing bound to happen all the time and the animal would be secreting juices at times when such secretion was not at all necessary to its existence and welfare. Even if the forces of internal inhibition checked this or that reflex, if it had needlessly operated a few times, there would still be a great waste and one that would do the reverse of what Pawlow claims the conditioned reflex to do, that is, to be the means of building up the complex conduct of the animal, to adjust it nicely to the environment. Moreover, if other conduct, such as leaping, running, fighting, etc., are to be considered as built up in the same manner, that is to say, are to be considered as conditioned reflexes based upon some unconditioned reflex, destruction would follow the first false reaction before internal inhibition could come into play. That is to say, if the animal, simply because of some accidental coincidence of stimuli, attacked a more powerful enemy or leapt down a precipice, death would result before internal inhibition could correct the error.

(4) Again it would seem impossible for unconditioned reflexes to occur if all the experiments which Pawlow gives as bearing upon what occurs in the laboratory have any relation to what occurs in real life. In other words, I maintain that parts of his laws absolutely contradict other parts so far as life itself is concerned. For example, the mere occurrence of a neutral agent coincidental with the agent that has caused a conditioned reflex cannot in itself be sufficient to inhibit that reflex, for if such were true then no conditioned reflex could become a part of the organic conduct of the animal. With the complexity and multiplicity of the environment there always would be such a coincidence, since sounds practically always occur coincidentally with some visual or some tactile stimulus. Therefore, either such inhibition by the coincidence of a neutral agent with the conditioned stimulus can bring about an inhibition only in the laboratory or else there are other conditions not brought out by Pawlow which must be considered. Indeed, it seems wholly unlikely that mere temporal coincidence alone in life could develop conditioned reflexes, or inhibit them. There must be something in the nature of the stimulus in addition to this temporal relation or something in the need of the organism which makes such a stimulus effective or ineffective for an animal.

Furthermore, one could hardly account for animal behavior by conditioned reflexes, even granted that they occur in the environment and are subject to all the laws that Pawlow has laid down. It must be remembered that in no case has Pawlow shown any con-

duct except the simple conduct of the unconditioned reflex. All the varied stimuli have done only one thing—called forth or inhibited salivary flow. The whole medley of sights and sounds, the electrical stimulations and hostile demonstrations have merely taken possession of the motor pathway that the ordinary salivary stimulus uses. They have not added or elaborated conduct; simply new afferent pathways have been opened, but no new efferent or motor manifestations have been evolved. Surely, the development of the infant organism to the adult is marked by at least two processes: first, an increasing awareness of the environment which would correspond perhaps to Pawlow's psychology, and second, *an increasing ability to react in complex ways to that environment, something which no experiment of Pawlow's at all demonstrates or even hints at, and something absolutely essential to his belief that all the higher conduct of animals can be summed up in complex conditioned reflexes.*

Nevertheless, Pawlow has done a wonderful service in analyzing the way the environment takes possession of motor pathways, and the way inhibitions arise. That stimuli in themselves indifferent, may through a grouping of factors become effective for conduct, is something which we, as neurologists and psychologists, continually neglect to take into account. The way perversions of the sexual capacity arise, potency and impotence, according to whether or not certain stimuli are present or absent would probably be best studied through a consideration of conditioned stimuli. Appetites of all kinds and resulting motor conduct would probably receive much elucidation from an analysis of the environment. The experiments on sleep and catalepsy are especially important and should be carefully studied from the standpoint of Pawlow, and it is possible that new light might be thrown on what are yet phenomena of comparative obscurity.

It is perhaps not irrelevant to present here some views concerning the environmental factors in delinquency and irregular human conduct. As profession evaluers of our fellowmen, we psychiatrists are quite apt to say of the persistent offender, "He's a defective delinquent," thus throwing back the cause at once to innate conditions. This seems to me to be a serious slighting of the problem. Innate conditions should be the very last to receive the onus, and the environment should be thoroughly studied first for the causative factors. Nor must it be forgotten that frequently it is not so much the character of the environmental factors as their grouping at some particular time, their *focusing*, as it were. The focus of the environment may fall on the individual at the time when his organic needs, *e, g.*, sexual, are low or it may fall on him when they are high. To put it more customarily, the temptation and the opportunity may or may not coincide with the height of desire, and the resulting conduct can only be measured by considering the co-

incidence of all the factors. Two individuals equally endowed with inhibition and character may act exactly opposite under precisely the same external conditions merely because the fluctuating internal conditions have happened to vary. And vice versa, two such individuals may react entirely opposite with similar internal conditions merely because of the fluctuating outer world. This is of particular importance if we remember that society's attitude toward the delinquent makes a second offence easier than reformation. From the time of the first offence nearly the entire weight of the social environment is against the individual, and not, as it should be, for him.

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## THE LABORATORY DIAGNOSIS OF ALVEOLODENTAL PYORRHEA.

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The term 'pyorrhea' has been used in the past to designate conditions around the teeth characterized by great recession of the gums, absorption of the alveolar process, loose teeth, and with the process accompanied by a large amount of pus that could be easily discerned, or demonstrated by massaging the gum toward the crown of the tooth. This is, in other words, a macroscopic picture. With the recognition of *Endamebæ buccalis* as one of the principal etiological factors of the disease,\* it is soon evident that such a clinical picture of pyorrhea is in reality the very end of a disease that had its beginning many months or even years ago at the edge of the gum margin, and at a time when with no appreciable destruction of the essential peridental membrane and alveolus a remedy that would have eradicated the endamebæ would also have offered the most favorable hope for a cure of the disease. The early diagnosis of such a condition could only have been made with the microscope. In the treatment of more advanced cases it is very desirable to discontinue specific treatment with the disappearance of the endamebæ, or to repeat the treatment if the healing lesions become re-infected before they heal by the slow natural process of granulation and scar-tissue formation. Such information can only be obtained by a thorough microscopical examination of each individual case. I am convinced that any routine plan of treatment without the aid of the microscope will be sure to fail in many instances, for as in other diseases the individual reactions to disease, drugs, and repair of damaged tissue are very variable.

Endamebæ never live and multiply on the normal gum margin. Thus the practical laboratory diagnosis of alveolodental pyorrhea would be made upon the demonstration of endamebæ taken from the lesion in the peridental membrane. The absolute differentiation of *Endamebæ buccalis* from the many other species of amebæ is not necessary in making a practical diagnosis when the material for examination is taken directly from the suspected lesion.

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\*Barrett: Preliminary Report. (*Dental Cosmos*, 1914, LVI, p. 948.)

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This examination is very easily made by anyone at all familiar with the microscope. The collection and preparation of material for examination with the various steps of the procedure will be briefly outlined in the following paragraphs.

*Collection of Material.*—Pathogenic endamebæ always live and reproduce at the very edge of the living tissue they are invading. In this instance it is the peridental membrane between the tooth and alveolar process. As the disease progresses with the resulting destruction of peridental membrane the surface layer of connective and epithelial tissue becomes inflamed and swollen closing the gap. Thus we have the formation of a pocket usually extending downward along one or more sides of the tooth. The secondary infection of pyogenic organisms carried into the granulating tissue at the bottom of such a pocket by the endamebæ causes a more or less profuse flow of pus which fills and often distends the pocket. Endamebæ do not reproduce, and actually barely live, in this necrotic material, and upon examination only an extremely few organisms can be demonstrated. It is very essential to remove all such material from advanced lesions, and in all cases to secure material from the very bottom of lesions. In material obtained from the proper location in the lesion, it is the rule to find many endamebæ in each field of the microscope. Many lesions are in almost inaccessible places for the collection of material, and many seemingly insignificant lesions extend to surprising depths. Very early lesions as well as further advanced ones of the front teeth can be readily reached with an ordinary toothpick. A properly curved dental scaler, such as the Younger scaler No. 8 and No. 9, is much better. Proper material can be obtained from almost any lesion with this instrument after a little practice. With any instrument, care should be taken not to traumatize the tissues. The granulations bleed easily, and in material diluted with several drops of blood the examination frequently fails to reveal parasites.

*Preparation of Material for Examination.*—With a clean toothpick the material is scraped from the end of the scaler onto a clean glass slide and spread out to form a thin layer with the flat side of the toothpick. This should be accomplished with one stroke, care being taken to hold the pick lightly and not to rub the material back and forth to avoid breaking up the amebæ. The slide should then be allowed to dry in the air, and when kept dry may be stained and examined at any convenient time. Stained preparations are recommended chiefly because these endamebæ are very small and are easily mistaken for the many different motile cells found in pus in the ordinary 'wet' preparations, whereas they are very easily identified in stained preparations; and also because they may be examined or compared with other specimens at leisure.

*Staining.*—(1) The smear is first fixed to the slide by passing the slide, film side up, through the flame of an alcohol lamp or Bunsen burner one or more times until the slide feels fairly hot when applied to the back of the hand.

(2) Apply one or two drops of Czaplewski's carbol-fuchsin for a few seconds. Rinse off excess of stain with water.

(3) Apply Loeffler's methylene-blue for fifteen to thirty seconds. Usually the stain is applied for a short time, rinsed off with water and examined against a light background. If not stained sufficiently the stain is again applied. Properly stained preparations have a deep purple color.

(4) Blot off excess of water. Dry in the air. Examine with the  $\frac{1}{12}$  mm. oil immersion lens.

*Examination and Identification.*—Material from the proper location in the lesions will show about as many red blood cells as pus cells, with a good many large cells from the granulating surface, many bacteria, spirochetes and a large number of endamebæ. The red blood cells stain a deep red. Pus cells show a bright purple irregularly-shaped nucleus with a light pink protoplasm. The larger tissue cells show a red to pink staining protoplasm with a small purple nucleus. Bacteria and spirochetes, depending upon the species and varieties, stain blue, purple, or bright red. The endamebæ vary from about the size of a pus cell to about four times their size. The endoplasm stains a deep blue and is surrounded by the slightly irregular border of purple staining ectoplasm. A small, round or oval nucleus staining a deep port wine color is found centrally along with from one to ten or twelve inclusion bodies of nuclear material staining a deep purple or blue-black. These inclusion bodies are contained in vacuoles shown by a clear ring about each one. Usually the whole endameba appears to be surrounded by a clear zone showing the retraction of the protoplasm while drying. Once properly-stained endamebæ are found, it will be readily appreciated that their appearance is so characteristic that they will never be mistaken for any other body likely to be found in pus from the locality in question.



## THE TREATMENT OF RECENTLY ACQUIRED SYPHILIS WITH MERCURY AND SALVARSAN.

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The treatment of syphilis in its entirety is too large a subject to be taken up in one paper. It is, therefore, cut down to a consideration of the treatment of recently acquired syphilis by mercury and salvarsan. These two drugs given either singly or in combination are so effective that it is no wonder that almost every observer has his own way of employing them, and each, in substantiation of the correctness of his course, confidently refers to his own successes. I have no doubt that by the employment of salvarsan alone syphilis can be cured. This is especially true of syphilis in its primary stage. I also know that by a judicious and prolonged treatment with mercury alone syphilis may be cured. There is equally no doubt in my mind that by the combined employment of both salvarsan and mercury, syphilis may be cured more certainly and more quickly than by the use of either one of these drugs alone.

### THE EMPLOYMENT OF MERCURY IN THE TREATMENT OF SYPHILIS.

It may now be taken as settled that syphilis was first brought into Europe from America by the returning sailors of Columbus, and it was shortly after this that the beneficial effects of mercury in this disease began to be appreciated, and between that time and the present it has held its place against all rivals. Furthermore, in the ancient days it was the simple metal mercury that was first employed, and one of the first ways of administering it was by rubbing it into the skin. It is the opinion of many men with large experience that the simple metal mercury still holds its place as the best form of the drug in this malady, and that inunctions or intramuscular or deep subcutaneous injections are the best ways of giving it. This statement does not carry with it the implication that other forms of the drug, and other ways of administering it are not efficacious. On the contrary, syphilis may be successfully treated by a great variety of forms of mercury given in a great many ways, but it is always the ion Hg. that is effective. It is indeed necessary that many forms and many ways of giving mercury should be known in order to meet special emergencies. Many cases of syphilis of bone, for instance, are refractory to everything but injections of calomel.

## INUNCTIONS.

The simple daily rubbing into the skin of a determined quantity of mercurial ointment is a most effective means of treating syphilis. In going through the large clinics for syphilis in Germany a few years ago, it was remarkable to see how often the dark-blue discolorations, characteristic of mercurial inunctions, were present, showing the prevalence of this method. It is decidedly to the credit of the oculists, also, that they never have abandoned this most active procedure.

The main disadvantages of the treatment are that it is dirty, that it is apt, by the discoloration, to betray the patient, that it is laborious, and that it therefore requires the patient to be of a steady, determined character to carry it out, and that there can be no accurate measurement of the dose. With all these disadvantages, however, the method still retains its place as both excellent and reliable.

In order to get the best results, however, definite directions must be given. Nothing can so readily contribute to failure as just writing off a prescription, and telling the patient to take a little of the ointment and rub it into the skin once a day. In this way I have heard a patient neglectfully ordered to rub into the skin a pea-sized portion or more of ointment, and I must say that I have seen apparently very good results even with these scanty directions, but this is rather a tribute to the efficacy of the drug than to the technical ability of the doctor.

There are two mercurial ointments, a 50 per cent. and a 33 per cent. The latter, as being softer and better adapted for rubbing in, is the preferable. It is important that the ointment be well triturated in order to break up the mercury into the finest globules. It is customary to order it dispensed in oiled-paper packages, each package containing the amount requisite for a rubbing, usually either 3 or 4 grm. I have special gelatine capsules made according to the following formula:—

R	Metallic mercury (redistilled) . . . . .	15	gr.
	Adipis lanae (hydrous) . . . . .	20¼	gr.
	Olive oil . . . . .	3	gr.
	White petrolatum . . . . .	6¾	gr.
	Carmine. . . . .	1	gr.

M.

The gelatine keeps the ointment moist, and the carmine disguises its color. Graduated tubes are also prepared by some drug firms.

The ointment is to be rubbed into one limb and the adjacent part of the trunk each day, so that in four days the whole surface will be covered with the exception of the face, hands, feet and back. A full suit of underwear is worn night and day. On the fifth day the patient remains anointed and continues wearing the same suit of underwear. On the sixth day a bath is taken, the underwear is changed, and a new round of rubbings is begun.

A course consists of between thirty to forty-five rubbings, and lasts for from six to eight weeks.

In rubbing in the ointment a very little is put on the skin, and then rubbed in by firm strokes with the ball of the thumb, and so on until the contents of the capsule are applied. The rubbing should be continued until the surface feels dry, not fatty; this takes from fifteen to twenty minutes.

Personal supervision or detailed written instructions are absolutely indispensable to secure that inunctions be carried out thoroughly. Furthermore, a physician should be able to judge from the character of a patient of the likelihood of his instructions being faithfully followed. Of what value can these or any other similar instructions be to a frivolous drug-befuddled prostitute! One must always also bear in mind that no matter how careless a patient is, the physician is held responsible for the result.

I have always considered it best that the patient should rub in the ointment himself, not alone from motives of secrecy, but also because the labor involved increases the respiration, starts the perspiration, opens the pores, brings the blood to the skin and so facilitates the entry of the ointment.

It must not be taken for granted that the ointment enters only through the skin. From the investigations of Neisser and Welander it appears that in inunctions the greater part of the mercury enters through the lungs by evaporation of the metal and inspiration, and not through the skin. This explains why inunctions done in the free air are not nearly so effective as when carried out in a small warm room. It also elucidates the observations made in cold countries that inunctions are more rapidly effective in winter than in summer, evidently because the patient does his rubbing in a small warm room with the windows closed. In the good old days the physicians who attended to this class of diseases, and who were often connected with bathing establishments, had what was called *la chambre noire*, the black chamber, in which, through long use, everything was coated with mercury. Here the patient lived, ate and slept. After a course in this delectable habitation he emerged like a wraith, with his teeth dancing in his head, and the saliva pouring from his mouth. Such extreme mercurializations are now justly deprecated, but they had the merit of bringing the patient



under the influence of the drug, which does not always happen in modern practice.

Although the greater part of the mercury in an inunction treatment enters the body by way of the lungs, yet a considerable quantity enters through the skin also, and it is very advantageous that it does. In the secondary stage of syphilis the thinned epidermis over the eruptions must more readily absorb the drug, and, furthermore, these eruptions and their correlated lymphatic nodules, constituting, as they do, depots of spirochetes, must be particularly sensitive to this kind of treatment.

#### MODIFICATIONS OF THE INUNCTION TREATMENT.

Naturally on finding that most of the mercury in inunctions attains the circulation by way of the lungs, many modifications have been proposed.

It has been suggested to spread the ointment on the skin and not to rub it in. Practically, however, it has been found that a good rubbing is most advantageous in bringing the patient under the influence of the drug.

Welander recommends wearing night and day a little flat bag hung about the neck and lying on the chest, containing mercury in powder form: mercurial powder.

Kromayer has devised a nasal mask covered with a cloth impregnated with mercury, to be worn over the mouth and nose all night. It is called a merculator mask. Although the resorption of mercury and the clinical effects are quite marked, yet it cannot be hygienic to breathe through such an apparatus, especially at night when the oxydizing processes are naturally at their lowest, and at a juncture when the patient is suffering from a debilitating disease.

Thalmann has suggested rubbing mercurial ointment into the anterior nasal openings, or to snuff up mercurial powder.

The very best of all these suggestions, however, is Blaschko's merkolint shirt. This is a sort of chest protector made of flannel and impregnated with mercury. These are made in three strengths, and Scholtz says that the strongest one has been shown by experiment to cause a decided resorption of mercury, and that it reacts favorably on syphilitic symptoms.

A medical friend of mine, who unfortunately acquired syphilis, used to keep an undershirt that through use had become saturated with mercury, and which he would wear night and day whenever he wished to take a mercurial treatment. This was the equivalent of Blaschko's merkolint shirt.

None of the above modifications, however, comes up to the inunction or injection treatment.

## ADMINISTRATION OF MERCURY BY SUBCUTANEOUS OR INTRAMUSCULAR INJECTION.

Many forms of mercury are employed for subcutaneous or intramuscular injection, but by far the best, to my mind, is grey oil.

*Grey Oil.*—Like mercurial ointment, grey oil is a suspension of the metal mercury in a fatty medium, and it has the advantage of being cleaner and more exact in its dosage than when administered as inunctions. As regards dosage, of course, it is absolutely impossible to tell how rapidly the drug is absorbed, so that exactitude has here more a relative than an absolute meaning.

Great care must be exercised in the technique. In the first place an absolutely reliable grey oil should be used, in which the mercury is present in the greatest concentration compatible with not separating out, so that the smallest bulk possible is injected in administering the dose. The oil should be so triturated that the mercury is in the finest division so as to facilitate absorption. The fatty medium used should not be readily decomposable as the fatty acids formed under such circumstances are very irritating. Finally it should be exact in its proportions, as on this depends the accuracy of the dose. The accurate measurement of the dose is of moment, as when the drug is once given it is irretrievable. I employ a forty per cent. grey oil, which is solid at ordinary room temperature. Just before injecting, it is to be heated by allowing the bottle to stand in hot water. When so fluidified it is to be well shaken so as to secure an even distribution of the metal, and the bottom of the bottle is rounded to facilitate this.

The needle employed should be sufficiently long to deposit the injection on the fascia of the gluteus muscle, and of such a calibre as to permit the oil to flow easily. The needles may be kept in alcohol in a covered glass dish.

The best position for the patient is lying face down, with the buttocks exposed, on a couch or operating table.

The needle, freed of alcohol so that it may not interfere with the fat of the grey oil, is plunged into the upper outer quadrant of the gluteal region, and then the barrel is attached. The attachment should be a sliding one, not a bayonet or a screw. The plunger should then be quickly drawn up so as to aspirate up any blood, should the needle have entered a blood-vessel. This is important in order to avoid throwing the injection into a blood-vessel, and so forming an embolus. The grey oil is again shaken to be sure of its even mixture, and the syringe is loaded, fixed to the needle, and injected. The syringe is then removed from the needle and air injected, so as to clear the lumen and prevent on withdrawal the grey oil trailing along the wound. A square of adhesive plaster is

then clapped on the little puncture, and the affair is over for one week.

As above indicated, the place chosen for injection is the upper outer quadrant of the gluteal region, and especially a palm-sized area beginning five fingerbreadths below the crista ilii, and lying above the outer end of the gluteal fold.

Syringes may be bought so graduated that each mark corresponds to 0.01 grm. of metallic mercury, and for an ordinary sized man 0.08 grm. is injected. The dose may be a little lower for a woman or for a small man.

In injecting into the subcutaneous tissue, the injection should be placed deep; if possible on the fascia of the muscle. It can be appreciated when the point of the needle reaches the fascia by the greater resistance. The resorption here takes place a little more slowly than when the injection is made into the muscle, but in other respects it is preferable.

It is interesting to consider in what form mercury may act when given as the simple metal. Two of its physical properties are of special interest here. In the first place, mercury volatilizes at all temperatures higher than absolute zero, and the higher the temperature the quicker it volatilizes. The efficacy of inunctions, indeed, as we have seen, depends on the property of volatilization, enabling it to enter the circulation by way of the lungs. Secondly, mercury has no very strong affinity for any element excepting chlorin, but it combines loosely with several. In the blood-current, which is quite hot to the hand, this volatilization would be marked. The mercury probably exists there as a gas, and therefore in a most favorable condition for chemical change. With its affinity for Cl it may be that some of it at least combines with the chlorin in the body, forming the bichloride. There is a vast amount of the halogen Cl in the body bound with Na, as NaCl, and it may be that free Cl is very active in the general tissue changes of the body. We know that it is a most active element in facilitating the reactions in organic chemistry, and the body activities are carried on by intricate reactions of this nature. It is probable, for instance, that chlorine shifts from the Na to H in forming the free hydrochloric acid of the stomach. In this shift the Cl would necessarily be nascent and would be in a favorable state for uniting with the Hg, and there may be many such shifts in the physiological processes.

When, therefore, mercury is given as the simple metal it may be that it partly passes through as the metal Hg, and partly as the combination  $\text{HgCl}_2$ , and it may readily be that when too much  $\text{HgCl}_2$  is suddenly formed it exerts an especially toxic effect, say on the kidneys.

*Calomel Injections.*—The technique for the injection of calomel



is the same as for grey oil, but here again the preparation used is of importance. I employ a specially prepared suspension of which the ordinary dose is 1 grm., containing 0.05 grm. of calomel. It is said to be painless, but it is only relatively so, and the patients return complaining bitterly of it. It is indeed less painful than the ordinary calomel injection, which is a crucifixion. Calomel injections sometimes cause large infiltrations, abscesses or even necrotic ulcers, and one of my confrères says that when it does so it seems to him to act better on the disease. It, at any rate, deviates temporarily the patient's thoughts from his disease, and from his other troubles.

In malignant syphilis and in syphilis of the internal organs, especially of the nervous system, calomel is the most powerful mercurial we possess. Because of the pain it occasions, Scholtz advises to give first a few injections of the salicylate or the thymoloacetate of mercury before giving those of calomel. He also recommends that the injection be deposited deep subcutaneously over the fascia of the muscle and not in the muscle itself, and that very particular pains should be taken to prevent the injection trailing along the needle track on withdrawing the needle. It is with calomel injections also that the greatest care should be taken in choosing, as above described, the most favorable location for injection.

*Salicylate of Mercury Injections.*—A one per cent. thoroughly triturated suspension of the salicylate of mercury in albolene is prepared, of which one gram is injected at weekly intervals. This is to be well shaken before injecting. The salicylate of mercury is on the borderline between the insoluble and the soluble preparations. It is insoluble in water, but it is slightly soluble in blood-serum. It is painful, about as much so as grey oil, but not nearly so much so as calomel.

The dose of the salicylate of mercury is one c.cm. of a 10 per cent. suspension; that is to say, 0.10 grm. of the salt. This may cause a slight rise of temperature, 38° to 38.50° C. A half dose may be given at first and a full dose three days afterwards. The other doses would follow at five-, six- or seven-day intervals. A course would consist of from ten to fifteen doses.

Salicylate of mercury, on account of its slight solubility, is of value when a quick yet sustained action is desired. It is quicker in its effects than either inunctions or insoluble injections, and it is more sustained in its action than injections of the bichloride or of the cyanide of mercury. Although it is not nearly so quick a spirocheticide as salvarsan, it may, however, be better under some circumstances. For instance, it is now well known that salvarsan when given at the height of the spirochetemia of early secondary syphilis, is more apt to cause encephalitis hemorrhagica than at any

other time in the course of the disease.\* In order to avoid this danger it has been proposed in such cases to give first a short course of mercury to reduce the spirochetemia. Because of its quick and at the same time enduring action a few injections of the salicylate of mercury are admirably adapted to this contingency.

Hydrargyrum thymoloaceticum is another of the insoluble, slowly absorbable mercurial preparations, suitable for subcutaneous injection.

It is interesting to note that the amount of mercury passed off by the kidneys during an injection treatment with grey oil, salicylate of mercury or calomel, is much greater than during an inunction treatment, or by internal treatment. It has been justly deduced that the greater excretion of mercury by the kidneys indicates a greater quantity of mercury in the blood, and therefore a greater germicidal action on the spirochetes in the blood. It must not be forgotten, however, that the greater amount of mercury eliminated by the kidneys requires greater watchfulness of the urine for evidence of mercurial nephritis.

*Bichloride of Mercury.*—Bichloride of mercury is one of the most frequently employed of the soluble preparations. It is used in 1 per cent. strength in normal salt solution, of which 1 or 2 c.cm. is injected every day or every other day. It, therefore, requires the frequent presence of the patient, it is painful, it quickly erodes steel needles and instruments, its action is quick but fleeting, and it causes deep infiltrations followed by scars. I treated a patient for nearly eight months about fifteen years ago, whose buttocks are still deeply dimpled and scarred.

A 2:1000 solution of the bichloride or of the biniodide has been used for intravenous injection. It has never found much favor among syphilographers, and I have never employed it.

Probably most, if not all, of the treatments by injection of insoluble mercurial preparations are really treatments with bichloride of mercury of a more permanent steady nature than the bichloride of mercury treatment itself. Metallic mercury has already been considered in this regard. All the insoluble salts must necessarily become soluble before being absorbed, and before they can act as antiseptics. The antiseptic action of calomel, for instance, when dusted in the eye, is due to the changing of the  $\text{Hg}_2\text{Cl}_2$  into  $\text{HgCl}_2$  on coming in contact with the  $\text{NaCl}$  in the alkaline medium of the tears. It is probable that the  $\text{NaCl}$  of the tissue juices and blood acts in the same way on the insoluble mercurial compounds given subcutaneously. As was mentioned before, the halogen,  $\text{Cl}$ , probably is very active in the tissue changes in general in the body. This nascent  $\text{Cl}$ , because of its affinity for mercury, might readily

\*Meirowsky and Kretzmer: *Salvarsan Therapy in Syphilis*. (*Praktische Ergebnisse auf dem Gebiete der Haut- und Geschlechtskrankheiten*, p. 444, 1914.)

act on it, changing it into  $\text{HgCl}_2$ . As we have seen, this change does occur when calomel is dusted in the eye, and it may be that the same reaction occurs with the other soluble and insoluble salts.

#### TREATMENT BY THE MOUTH.

•Treatment by the mouth is taken up last because of being the weakest and the least thorough. It is neither immediately so efficacious nor so enduring as the other treatments. To say that good results cannot be achieved in this way would, however, be equally far from the truth. The only two instances of reinfection of syphilis I ever saw, previous to the introduction of salvarsan, were in men who had been treated for a long time, following their first infection, by full doses of the protiodide of mercury. Nevertheless, the internal treatment of syphilis with mercury is now limited to its employment as an adjuvant to treatment by inunction or injection, or as a mild intervening treatment in latent syphilis.

If enough mercury is given in this way fully to control the disease it is apt to cause irritation of the stomach and intestines with diarrhea. The very readily soluble forms, such as the bichloride and the biniodide, are particularly hard on the stomach, while the more slowly soluble combinations, such as the protiodide and the tannate, are not nearly so severe. The tannate is particularly mild, and has been called an internal inunction, and was a favorite with Lustgarten, whom I always regarded as one of the most finished therapists of my acquaintance. The metal mercury is also used as the pil. hydrarg. or as mercury and chalk powder. The latter was especially esteemed by Jonathan Hutchinson, and certainly it is one of the mildest mercurials in its effects on the stomach.

Of late years there has been introduced the chlorate of mercury, as meral capsules. Each meral capsule contains albuminate of tannin 0.1 gm., and chlorate of mercury 0.05 gm. Six or eight capsules a day is a sufficient dose. Meral is readily absorbed, irritates very little, and the results are good.

Merlusan is a colloidal mercury combined with tyrosin. It is said to be well borne, and readily absorbed.

In giving mercury by the mouth it is frequently combined with opium in order to quiet irritation and to prevent diarrhea. Although the irritation is quieted, yet it must be present, and is only masked by the analgesic effect of the opium. Furthermore, opium diminishes the secretions of the great internal organs, and must interfere with the elimination of the mercury. In so far as it interferes with elimination, it must interfere with the beneficial action of the drug, because, in my view, the stream of mercury passing through the blood and out at the kidneys, carrying with it the disease products, is one of the chief benefits of the treatment.



## ELIMINATION AS AN ADJUVANT TO SPECIFIC MEDICATION.

As we have seen, the amount of mercury in the blood is of great importance in the treatment of syphilis. As an excess is dangerous, however, the elimination of the drug is of almost as much importance as the dose. It is indeed a fundamental principle, always to be kept in mind, that the drug should not loiter in the body, but that it should quickly and easily pass through, carrying with it the specific poisons and antibodies caused by the disease. The greater part of this elimination, especially in inunctions or in injections, takes place through the kidneys. If, therefore, the kidneys are not active, or if the kidneys are very sensitive to mercury, and do not eliminate it readily, it may accumulate in the blood to a noxious extent, and may cause nephritis or diabetes, for it is now recognized that mercury may incite diabetes.

Elimination in general may be, of course, stimulated by increasing the action of the bowels, and the elimination of mercury is particularly favorably influenced by this means, because undoubtedly one of the determinations of mercury is to the large bowel. Elimination may also be stimulated by increasing the activity of the skin, by hot baths, either of air, steam or water, and by the administration of hot drinks, which naturally not alone stimulate the sweat, but also the kidneys and the bowels.

## SALVARSAN.

Salvarsan has a more strikingly quick effect on syphilis than mercury, and it has more spirocheticidal power, but, nevertheless, the steady basic treatment of this disease must be done with mercury. Treatment is to be begun as early as the diagnosis is made, and with the demonstration of the pale spirochetes the diagnosis often can be made very early indeed.

Except when the patient is in full eruption, signifying full spirochetemia, the treatment is to be started with an infusion of salvarsan. During the time of full spirochetemia, as before mentioned, the danger from encephalitis hemorrhagica is decidedly increased. In such a case a short preliminary mercurial treatment as advised by Lesser, may be given to reduce the spirochetemia.

The dose of salvarsan need not be greater than 0.30 or 0.45 gm. It has been found that this dose is as efficient as a larger one, and is not nearly so likely to cause encephalitis hemorrhagica. Of course, the danger from a dose twice this size is not at all great; and a physician might employ it during his whole practice without meeting with a misfortune. When such a misfortune does occur, however, it is most disastrous, and furthermore there is no object in taking such risks without adequate compensatory advantages. A physician, handling as he does enormously toxic drugs in his daily

practice, runs enough unavoidable risks without assuming unnecessary avoidable ones.

Scholtz\* starts out with the proposition, as shown by Abelin, that the salvarsan infused is almost completely eliminated in three or four hours, and this holds good whether the quantity infused is 0.60 or 0.30 or 0.40 grm. Furthermore, as far as the disappearance of clinical symptoms is concerned a dose of 0.30 or 0.40 grm. acts as promptly as one of 0.50 or 0.60 grm. Indeed Castelli in Ehrlich's laboratory has shown that very minute doses, frequently and closely repeated, show a decided general action.

With the above facts in hand, Scholtz begins by giving three or four infusions of 0.20 grm. to 0.35 grm. each within two days, so that the patient in these two days of treatment receives 0.80 to 1.00 grm. of salvarsan. The first infusion is given between eight and nine o'clock in the morning, and the second at noon on each of these two days. At the same time an inunction course is begun, and after each group of four inunctions an injection of either the salicylate of mercury, or grey oil, or calomel is given. After each injection, the patient stays in bed for one or two days. After four or five weeks of this mercurial course, the patient is to receive salvarsan in the same way as at the beginning, followed by another course of mercury, lasting from two to four weeks.

Scholtz reports excellent results from this mode of treatment. Out of three hundred and sixteen patients with early primary or secondary syphilis, including latent syphilis with positive Wassermann reactions in the first and second year after infection, two hundred and seventy-eight of them had shown no recurrences, and had constantly negative Wassermann reactions. Twenty-five of these showed recurrences, and in thirteen either the Wassermann reaction remained positive in spite of the treatment, or it only temporarily became negative.

In primary syphilis his results were far better. In forty-four cases no recurrences took place and the Wassermann reaction was constantly negative. I think that these relatively very favorable results in primary syphilis accord with the general experience when any good combined treatment is instituted. Under such circumstances the disease appears often to be really aborted.

The difficulties in America of carrying out such a treatment in a disease like syphilis are obvious. The internment of the patient in a hospital is of itself a serious matter in more ways than one. The necessity of giving small, quickly repeated doses is also questionable.

Gennerich gives a mercurial course of from five to six weeks, and about once a week during that course the patient receives a

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\*Lehrbuch der Haut- und Geschlechtskrankheiten, Bd. I, s. 417. (Too much cannot be said in praise of this admirable book.)

salvarsan infusion. In about two or three months this course is repeated.

Following the principle that a chronic disease should receive chronic treatment, I usually give an infusion of 0.40 gm. of salvarsan, that is 0.60 gm. of neosalvarsan, followed by a course of 10 doses of grey oil of about 0.08 gm. to each dose. This takes ten weeks for its accomplishment. This is followed after a two or three weeks' interval by another similar course consisting of one dose of neosalvarsan followed by grey oil. After three weeks a Wassermann test is made, and whether positive or negative, another course is given, which is sufficient for the first year.

The basis of this treatment is mercurial, and the rôle of the arsenical preparation is regarded as being adjuvantial. It is a powerful, beneficent, and indispensable adjuvant, but still an adjuvant.

There is more effect from a combined treatment by mercury and salvarsan than simply the addition of a mercurial treatment to a salvarsan treatment. Before salvarsan was discovered it was found that when a patient was refractory to mercurial treatment, if a full dose of atoxyl was given, mercury would then be much more effective. I was first made aware of this in a conversation with Kreibich. The presence of the atoxyl may have a facilitating or catalytic effect, as so often happens in chemistry. I believe that a similar result is achieved with salvarsan, and that the mercury acts much more effectively than when given alone. Furthermore, salvarsan behaves frequently as a wonderful tonic, rendering the patient better able to combat his disease.



RE-EDUCATION AS A FACTOR IN THE TREATMENT OF  
DEMENTIA PRÆCOX.

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That the dementia præcox patients comprise about one-third of the inmates of our state hospitals is a recognized fact. Nor is it surprising that the percentage of recoveries among this class of patients is very low, when one takes into consideration how little systematized effort is exerted to aid their recovery or improvement; so little, indeed, that most of them finally reach that hopeless group known as 'the chronic insane.'

It was the writer's privilege to be in daily association with a number of dementia præcox patients for over seven years. His first hasty conclusion concerning them was that they were hard to manage and better let alone. Frequent contact with them, however, caused him to realize that one must study these patients, and learn to understand them as one would a child, before they can be helped.

In this form of insanity the emotions, attention, will-power, and association of ideas undergo a systematic disintegration, while the memory, orientation and power of comprehension are preserved or but slightly affected. Because of this fact, as well as that it generally attacks the youthful, the writer felt that an educational regime would be beneficial. It is surprising at times to note the acuteness of observation, the quickness at repartee, and the retentive memory of patients who, at other times, would act with extreme foolishness. These instances were not frequent, the writer admits, but they served to show that mental activity was merely quiescent or impeded, not destroyed.

We all have met the badly-trained, spoilt child who does everything with an air of suspicion and hostility; whose parents seemed to have had always in mind the idea of checking and suppression. As the writer noted the unruliness, the lack of restraint, and the utter indifference to the result of their actions which the dementia præcox patients exhibited, he felt they were but children. In fact, the history of many of these patients show that they were the pampered, coddled, spoilt children of the family.

In the acute stage of the disease, patients are very rebellious toward authority, as well as adverse to receiving advice; they are

also sceptical, ungrateful, egotistical and cynical. They seem to live in a world of their own, and are apparently content in their isolation. When the acute stage has passed they become less impulsive, and take more readily to suggestion and discipline.

Those under the writer's care had passed the acute stage, and he felt a desire to make at least an effort to arouse their dormant faculties. If one were endeavoring to overcome bad training in a child, the first thing would be to remove their feeling of restraint and hostility, allowing them freedom of action as far as compatible with proper discipline. The writer could see no reason why the same course would not be effective with dementia præcox patients.

One man of the katatonic type held the writer's attention at first. He was unusually obstinate and resistant to restraint and discipline, and in his rebelliousness and obstinacy refused to conform to the hospital rules, thus exacting almost individual attention from the attendants. All efforts to draw him into conversation or arouse his interest failed at first. Patience was rewarded one day, however, when he was discovered reading an article in a magazine the writer had left with him the previous day. This seemed to be the entering wedge; for it awakened a desire for more reading, and before many days he was drawn into a discussion of something he had read. From that time on this patient was encouraged and led, much as one would a backward child.

For a long time he made no further advancement; then one day he gathered two or three patients around him, and read aloud an article to them. Fearful of driving him back into his shell, the writer made no comment on the reading-circle, and it slowly grew to larger proportions. Even this slight mental occupation caused a noticeable improvement in the patient; for he became more amenable to the rules of the ward, and began to take an interest in his surroundings.

The evident pleasure the reading-circle afforded this patient was what gave the writer the idea of placing him in charge of a systematized work among other patients. This plan was suggested to him very subtly, at first, and though it was not received enthusiastically, neither was it repulsed. Later he agreed to try the plan.

When the promise to start a school in his ward was secured, we still had a difficult task confronting us—that of getting together enough interested patients to form a school, for it is difficult for a dementia præcox to mix with other patients or hold a sustained interest in anything. Again we used the tactics one would use with a timid child. The patients were not over-urged or threatened into the work, but they could not help seeing that something unusual was taking place in the ward. Thus, first their curiosity, then their interest was aroused, and before long a school was in systematic,

working order. The bell was rung promptly at eleven in the morning, and the school hour lasted until the whistle blew at noon, and the afternoon session was from two until three.

It may be because of the fact that dementia præcox patients respond more readily to a regime treatment than to one of drugs, that those attending the school adapted themselves to the routine of the work, and subordinated themselves to the now thoroughly aroused stronger will-power of the teacher-patient. Of course, the educational treatment had to be started on a plane suitable to the intelligence of the patients attending. At first their attention was attracted by the reading of very simple, profusely illustrated stories; gradually easy spelling and mathematical problems were



Fig. 1.—A class of mental patients receiving instructions at Jacksonville State Hospital. (With the exception of two or three, the class is composed of dementia præcox patients.)

added—lessons that would be play for a normal child—but applied in their simplicity to these patients because of the fear that harder tasks might drive them away.

To attain even this small beginning was a slow process, and for months little progress seemed to be made. The work was continued, however, and, at the suggestion of the teacher, history, geography and writing were added to the school curriculum. Soon there began to be an air of alertness and interest in surroundings among patients; they were easier to control, and began to look forward eagerly to school-time, some of them arranging the chairs and taking their places before the bell rang.

It was, however, no easy task to teach these patients, for with some of them it required great patience to arouse even a slight in-



terest; others needed a stronger sense-stimulus, and still others repeated sense-stimulus to awaken perception. But contact with the insane soon reveals the fact that even the most chronic will respond to some sense-stimulation, for no matter how demented a patient is he learns to respond to the bell for meals, find his place at the table, remain standing until he receives orders to sit down, and return after the meal to his own special corner in the ward. It is also true that some of the untidy patients can be trained to respond to the calls of nature.

Facts such as these seem to emphasize the feasibility of re-education as a factor in the treatment of dementia præcox. The writer feels that the idea of incurability in connection with this class of patients has grown all too prevalent. That their physical wants are well taken care of is not to be denied, but the essential thing—the restoration and conservation of their latent mentality—is overlooked. This, however, is not the fault of our state hospitals. The attendants have too little education to undertake the re-education of patients; while the staff physicians have so many patients under their care that they have very little time for an intelligent study of individual cases.

During the writer's service in the hospital he was much impressed by the fact that the patients who work on detail (as on the farm, in the dining-room, the kitchen, etc.) or those who have regular duties to perform, are the least troublesome, and make the most rapid strides toward recovery. The realization of this caused the writer to go on with his plan of re-education after a two-year trial.

By this time there was a great improvement among the former sullen, defiant patients, and in the teacher-patient the change was almost unbelievable. He was, in addition to having full charge of the school, making money enough to clothe himself, as well as buy a few luxuries, by selling cigars and chewing-gum, and doing odd jobs for the attendants. He was thoroughly interested in the school-work, and was adding new features to it from time to time, such as a monthly spell-down and a singing class. Later this singing class was given a separate hour between supper and bedtime, as certain patients would join in the singing, who could not be induced to attend the school. At this time it was made a rule that those attending classes should be neat and clean, and it was not long until there was a friendly spirit of rivalry as to who made the neatest appearance.

A short time after the starting of the singing class, a Sunday-school was organized in the ward, the untiring teacher filling the triple position of superintendent, teacher and preacher. And in the summer of that year a regular course in physical culture was introduced, races and contests being added later. While in the

fourth year, the last but not least interesting work was undertaken. This was the organization of a secret society among the student-patients. The initiation fee of this society was the attainment of certain marks in school. So great was the interest taken in this society that few of the pupils failed to attain the required mark.

This school was carried on for five years. In that time the ward changed from a moderately violent one to one of the best in the hospital; a fact which brought forth words of commendation from relatives and friends of the patients. Many of those attending the classes showed such improvement that they were allowed to go home, and the teacher-patient was discharged as cured, and has been earning a good living for his family for several years.

Taking into consideration the success of this school as well as the large percentage of dementia præcox in our state hospitals, it seems only fair that they should receive their chance, rather than be allowed to grow more demented through thoughtless neglect. Most of the work done in dementia præcox has been the chemico-pathology or psychopathology, and recently the Abderhalden reaction. Very little has been accomplished in the way of treatment, although different forms of treatment have been tried, as partial thyroidectomy, sex glands re-implantation, and inoculation with certain strains of the streptococcus erysipelatis.

Special teachers, well versed in child-training, should be employed if the re-education treatment is undertaken, for it is necessary to reward, commend and rekindle the spirit of emulation in these patients, as one would in a child. A teacher will often have to resort to using building-blocks, showing pictures, and teaching the making of paper chains and toys, as is done in kindergarten. Later their interest might be aroused by setting them to tasks having a similarity to the work they did before entering the hospital.

It has been said that "subconscious impressions entering and stimulating the subconscious regions of memory are most active, awakening *early* impressions and moods, and so call up in turn their association." In studying the insane, one soon realizes that many of the idiosyncrasies, likes, dislikes and prejudices are related to early impressions, also that many curious incidents in the lives of the insane can be accounted for in the history of their subconscious selves. If one accepts this statement it is not hard to believe that the strange words, actions and gestures of the insane are merely reflections of their childhood, even though the subconscious self is fed by impressions in later life as well as childhood.

Struempel says of dementia præcox: "Methodical instruction such as is given to the feeble-minded, but adjusted to the individual case, has been of distinct benefit in reviving dormant mental powers and enabling the patient to retain, if not regain, some portion of his intelligence."

If deterioration can be arrested in a dementia præcox by proper training, should not an effort be made in that direction, even though such treatment may not make normal citizens of these patients? A physician who has successfully carried a patient through a serious illness does not expect him to return immediately to the tasks he had been able to accomplish before that illness. He advises him to resume such work slowly, or undertake lighter tasks. Why then should we expect one who has been mentally sick for years to return to his old place in the world unless he can be under sympathetic care and guidance?



## ADDISON'S DISEASE IN A NEGRO, WITH INVOLVEMENT OF THE CENTRAL NERVOUS SYSTEM.

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The original description of the bronzed skin syndrome given by Addison in 1855, and known, as Trousseau proposed, under the name of Addison's disease, concerned individuals of the Caucasian race in whom the bronzed hue of the integument can be easily discerned. When an analogous condition occurs in an individual with a deeply pigmented skin, such as a negro, the difficulty of recognizing the condition becomes great. Fortunately, the group of symptoms, which are almost invariably present in the affection in which the skin changes its original color, is so characteristic that the altered cutaneous pigmentation becomes a negligible factor. This is particularly applicable to the yellow or dark races.

The observation which is about to be reported is interesting from several points of view. First, the individual was a negro with a dark skin. Changes of pigmentation occurred in various areas of the body, but these areas appeared exceedingly dark and they contrasted in a very striking manner with the rest of the skin. It is possible that the adrenal element which renders the integument of a white individual bronzed played the same rôle here, and the deeply dark discoloration is the result of the effect of the adrenal factor on a skin which is already pigmented. In the second place, in my case the central nervous system was found involved. This circumstance opens certain speculations as to a possible relationship between the pathological state of the suprarenal glands and the cerebrospinal axis. The history is as follows:—

Male, longshoreman, mulatto, *æt.* forty-two, first complained of pain in the head and dizziness in June, 1913. Soon he developed vomiting spells and diarrhea and he rapidly lost in weight. At the same time the general weakness disabled him totally from work. In September of the same year he noticed that the skin of the face, and the dorsum of the hands began to get dark, and in one month it became very dark (coal color). On the palms of the hands and soles of the feet, which were almost white, he noticed isolated dark spots.

When he came under my observation, March, 1914, at the Douglass Hospital, he presented the following picture. He was a large man, about 6 ft. tall. The skin of the body was somewhat darker than that of a West Indian, but the face, dorsum of the hands, feet and also the knees were extremely dark (resembling coal). The contrast between these areas and the remainder of the skin was very

striking. Dark-bluish spots were seen on the palms of the hands and soles of the feet. Similar small spots were also seen on the mucous membrane of the mouth, cheeks and pharynx. He was confined to bed because of extreme asthenia and exhaustion upon the least physical effort, so that he avoided the slightest exertion and remained in bed in dorsal attitude. He was very somnolent and he still had attacks of vomiting, especially in the morning upon awakening. The vomitus was colorless and contained mucus. The bowel movements were very frequent, watery and abundant, although at the outset of his disease he was obstinately constipated. According to the statement of the patient's wife he lost 40 lb. within the last six months. The body was constantly cold and hypothermia was present; the temperature ranged from 96.5 to 97.5°. Attempts at walking were unsatisfactory, as he was unable to stand longer than two minutes. The amount of walking was, however, sufficient to observe the following phenomenon: When he put forward one leg after another, the trunk did not follow the legs; it did not advance simultaneously with the legs. He presented therefore a phenomenon called *asynergia*, which is met with in cerebellar diseases. The power of individual limbs was very low; he could not hold up his legs or arms for longer than a few seconds. He had to be fed. The knee-jerks were faintly obtainable on the right side and only on reinforcement, but not at all on the left side. There was no other abnormal tendon or cutaneous reflex. Objective sensibility was normal all over the body. He complained, however, of abdominal pain, especially in the epigastric region. The function of the sphincters was intact. The heart showed a presystolic murmur at the apex, and the second aortic sound was accentuated. The pulse was small and slow—60 per minute. The sphygmomanometer showed 80-100 mm. of mercury. The blood examination, made repeatedly, presented nothing abnormal. The hemoglobin was 90. There was no evidence of quantitative or qualitative changes of the blood corpuscles. The eye examination was negative. The Wassermann test of blood-serum and spinal fluid was negative. The patient's previous personal history was free from diseases, but he drank heavily for a number of years. Nevertheless, he worked as a longshoreman uninterruptedly for twenty years. The family history showed that an uncle and one brother died from some chronic lung affection, presumably tuberculosis.

The change of color of the skin, the bluish spots on the mucous membranes, the general marked asthenia, the profuse diarrhea with frequent vomiting, the condition of the pulse, and arterial tension, the somnolence, anorexia, loss in weight—the entire picture of the disease suggested at once Addison's syndrome.

A course of treatment, consisting of a rich diet together with medications directed towards arresting the diarrhea, also administration of adrenalin, succeeded in improving the patient's condition, and for a period of three weeks all his functions became ameliorated. Gradually, however, he returned to his previous condition. During a period of six weeks his condition was irregular. Delirium with hallucinations set in; the sphincters became uncontrollable and the patient rapidly expired. It is interesting to observe that during his entire illness, since he came under my observation, his temperature was never above 97.5° and the blood-pressure oscillated from 80 to 100.

Autopsy performed ten hours later gave the following findings: Heart normal in size but pale in color; the tricuspid valves are thickened and slightly calcareous; mitral valves greatly thickened; aorta normal. The left lung shows at the apex calcareous nodules and is emphysematous. The right lung is adherent to the pericardium, diaphragm and to the chest wall. Calcareous nodules are seen at the apex. The left pleura is adherent to the surrounding tissues. The peritoneum is thickened and adherent. The small and large in-

testines are adherent through their entire course. Spleen is much enlarged and congested. Liver, pancreas, stomach and kidneys are found to be one large mass bound together by strong adhesions. The most interesting part is the condition of the suprarenal glands. Their size is very large and the kidneys appear as if superimposed by two very large tumors. Microscopical study of the latter shows distinct tubercular lesions.

Calvarium is thin. Upon opening the dura, a large amount of serous fluid escaped. The upper part of the brain is congested.

Sections of the brain revealed nothing abnormal. Section of the cerebellum revealed an interesting condition. There was an area of softening in the right dentate nucleus. The left dentate nucleus and the rest of the cerebellum were intact.

Microscopical study of the spinal cord shows a very important condition. From the midthoracic down to the lumbar segment the cord is surrounded by a somewhat thickened pia, especially in its anterior and posterior portions. A very marked round-cell infiltration is seen at that level within the pia. The round cells are particularly abundant and dense at the level of the anterior and posterior roots. With Marchi stain some degeneration is observed in the posterior roots. The central canal of the cord is sometimes seen obliterated. The direct cerebellar tract in the lower thoracic segment appears to take the Weigert stain less deeply on one side than on the other. The cells of Clarke's column on the same side are fewer in number and not as well outlined as on the opposite side.

To sum up we have here a typical case of Addison's disease in a middle-aged colored man, complicated by symptoms referable to the central nervous system, especially cerebellum. Post-mortem we find very large suprarenal capsules, tubercular in nature, a softening in one cerebellar hemisphere, distinct inflammation of the soft meninges in the thoracic portion of the spinal cord, also recent degenerative changes in the posterior roots.

The simultaneous involvement of the adrenals and the central nervous system in this case opens up a question of physiological importance. Is there any causal relationship between the two organs? If so, which of the two is the primary condition? If we refer to the pathological and experimental data on the subject, we find the following informations. Burrelli<sup>1</sup> was among the first to publish full autopsy records of cases of Addison's disease with involvement of the central nervous system. Semmola<sup>2</sup> gives details of a case in which most of the changes were confined to the spinal cord. In the latter were found softening of the white matter, degeneration of posterior roots and posterior columns, changes in cells and obliteration of the central canal. Juergens<sup>3</sup> found degeneration of posterior roots. Babès and Kalindero<sup>4</sup> found sclerosis of posterior roots and columns (mostly in the lower thoracic segments), also chronic neuritis of anterior and posterior roots. Klippel<sup>5</sup> found evidences of a subacute state of diffuse encephalitis in cases of Addison's disease; convulsions and coma were the clinical symptoms. Experimentally, Tizzoni<sup>6</sup> observed changes in the cord similar to those of Semmola after removal of suprarenals in animals. Ettlinger and Nageotte<sup>7</sup>



decapsulated animals and found, subsequently, marked lesions in the cells of the central nervous system. Ruju<sup>8</sup> observed arrest of development of suprarenal capsules in anencephalics, which was in direct relation to the defective development of the cerebrospinal axis. There are cases on record with diseased adrenals which were accompanied during life by psychic phenomena, such as delirium, depression, etc.<sup>9</sup> Phillips<sup>10</sup> reports a case of sclerosed and enlarged adrenals, and during life symptoms of paresis were present, *viz.*,



Fig. 1.—Kidneys with much enlarged adrenals.

Fig. 2.—Cerebellum showing a softened area on the right near the median line.

unequal pupils, tremor, slow speech, defective memory, impaired judgment, depression, hypochondriacal delusions with hallucinations of smell and taste. The symptoms of Addison's disease were equally present. Klein<sup>11</sup> has recently seen a patient with Addison's syndrome in whom epileptic attacks and markedly diminished knee-jerks were present.

These few examples, clinical, pathological and experimental, all

tend to prove the fact that the coexistence of lesions in the adrenals and in the central nervous system is more than a coincidence.

If we consider the anatomical arrangement of the suprarenal capsules and their connections we will recall the following facts. The adrenals consist of two portions, the morphological distinction of which is very deep. One is the cortex, the cells of which have for function to maintain life, to play an important rôle in the development of the body during early periods of life. The other is of nervous origin, and has for function to influence the muscular portion of blood-vessel walls. It consists of a semi-fluid mass, rich in sympathetic nerves, as shown by the researches of Nagel, Koelliker, Henle, Bergmann and contains adrenalin. The latter is secreted by the medullary cells directly into venous circulation. There is a relationship between the adrenalin cells and the ganglion cells of the sympathetic system; the vasomotor function mentioned above is common to both. Gaskell<sup>12</sup> had traced them in vertebrates down the scale, and showed how the sympathetic nerves and adrenalin cells appear side by side in the worms. That when one is involved the other suffers can be seen from the observations of Kahlden.<sup>13</sup> He collected 37 cases of disease of adrenals, and changes were found in the semilunar ganglia and splanchnic nerves in all of them.

The sympathetic system is that part of the nervous apparatus which controls largely the glandular tissues, besides being distributed to the non-striated muscles of the body. Although it may independently influence the splanchnic organs, nevertheless it is intimately associated with the central nervous system, both embryologically and anatomically. The neurons of both originate from the ectoderm of the dorsal midline in the embryo. Anatomically, it is well known that some of the sympathetic nerves carry with them cerebrospinal nerves and vice versa, the cerebrospinal nerves carry many sympathetic fibres. This communication is established through the rami communicantes, bundles of fine fibres receiving efferent and afferent nerve fibrils. The efferent ones originate in the gray matter of the spinal cord from which they emerge together with the anterior horn, reach the rami, and end in the nearest sympathetic ganglia. The afferent fibres originate in the sympathetic ganglia, reach the rami communicantes and then the spinal nerve trunk, and end in the spinal ganglia. Thus impulses are transmitted to the spinal cord through the posterior roots.

The sympathetic nervous system consists of two sympathetic trunks lying close to the vertebral column, many ganglia, plexuses and rami connecting the ganglia. The trunks, with their ganglia, present cervical, thoracic, lumbar and sacral portions. The ganglia are interposed in the trunks and are to be found in the number of twenty-two in each trunk, extending from the second cervical

vertebra to the first piece of the coccyx. The thoracic portion of the trunk, in which we are presently interested, possesses eleven ganglia. Each ganglion receives a white ramus communicans from a thoracic nerve and gives off a gray ramus communicans to that nerve. All the white rami influence the thoracic viscera; the lower branches are distributed in the abdominal viscera. The gray branches, passing from the ganglia form central branches which reach the spinal nerves and peripheral branches. The upper ones innervate the thoracic viscera. The lower ones form the splanchnic nerves supplying the abdominal organs. One of them called the least splanchnic nerve ends in the renal plexus. Besides the trunks and ganglia, the sympathetic system contains also three great pre-vertebral plexuses—namely, the cardiac, the solar or epigastric, and the pelvic or hypogastric. The solar plexus is the largest. It occupies the interval between the suprarenal glands. Its two ganglia (semilunar) lie at the inner borders of the suprarenals. From the solar plexus and its ganglia emerge numerous fibres which form small paired and impaired plexuses, which distribute fine fibres to various abdominal organs. Among them we find two suprarenal plexuses the fibres of which come mainly from the two semilunar ganglia and are distributed to the medullary substance of the suprarenal bodies.

Thus have been traced the physiological and anatomical connections between the adrenals and the central nervous system. It is therefore easy to conceive that a lesion or a functional disturbance of the adrenals, especially of their medullary portion, will have its effect on the central nervous system, via the suprarenal plexus, semilunar ganglia, rami communicantes and posterior spinal ganglia. In fact, a lesion of any portion of the communicating pathway between the spinal cord and the suprarenals is apt to produce disturbances at either end.

In the case reported here, both ends were found involved. The adrenal bodies were found enormously enlarged and tubercular. The spinal cord from the mid-dorsal down to the lumbar segment was found surrounded by an inflamed pia with a dense round cell infiltration, especially at the level of the anterior and posterior roots. The latter presented evidences of degeneration. It is therefore manifest that the seat of the lesion corresponds precisely to the above described anatomical grouping of the connections between the central nervous system, the sympathetic apparatus and the suprarenal bodies. The present case consequently appears to be a valuable addition to the records of other observers relative to involvement of the central nervous system in Addison's disease. It is possible, if not probable, that if in every case of this affection that comes to autopsy the central nervous system were examined as diligently as the suprarenal bodies, more lesions could be traced



in the former than it has been mentioned heretofore. Even in the absence during life of gross clinical manifestations referable to the nervous system, the cerebrospinal axis should be explored macro- and microscopically in every case of Addison's symptom-group.

In the present case there was also a focus of softening in one cerebellar hemisphere, in the nucleus dentatus close to the middle line. If we consider the fact that the cells of Clarke's column on one side were fewer in number and not as well outlined as on the other side, also if we recall that the direct cerebellar tract in the cord, which originates in the cells of Clarke's column on the same side, did not take stain as well as on the other side (otherwise speaking, that it was in a pathological state), and finally, if we consider the anatomical fact that the direct cerebellar tract ascends from the cord to the medulla where it enters into the formation of the inferior cerebellar peduncles, the fibres of which enter the cerebellum and terminate in its middle portion—the vermis—it is possible, in view of all these data, to explain to a certain extent the chain of pathological findings in the present case. Although this manner of tracing the lesion in the cerebellum is a plausible one, nevertheless it is not absolute. The focus of softening found in the cerebellum may have been coincidental with the tubercular lesion found in the adrenals. An individual having a tubercular focus in one viscus is apt to develop one other or several similar foci in other viscera. Besides, the degenerated fibres in the cerebello-spinal fasciculus were so few that under the microscope the condition presented itself only as a less intensely stained area than on the opposite side. The involvement of Clarke's column of cells on the same side was also slight. That such a slight lesion of an ascending tract of fibres should produce at the terminal station of the latter, or rather in its vicinity, a focus of softening, is rather unusual.

Another problem that confronts us in the interpretation of the findings, is to determine the seat of the initial disorder—namely, whether the lesion appeared first in the adrenal bodies and involved secondarily the central nervous system, or vice versa, the lesion appearing first in the thoracic cord and via the posterior ganglia and the sympathetic fibres involved the adrenals secondarily. While it is true that the meninges and the spinal roots showed distinct evidences of involvement, nevertheless the degeneration in the posterior roots was only of recent date, as it was proved by the Marchi method of staining. As the condition of the adrenals was undoubtedly of long-standing, judging from their enormous size, it is to presume that the posterior spinal roots became diseased secondarily. Addison's disease, therefore, was the original malady and the disturbed function of the adrenals led through the sympathetic system to a degenerative state of the posterior spinal roots.

In considering the pathogenesis of Addison's disease, which is still debatable in view of the mixed post-mortem findings, it is well to call attention to the symptom of asthenia present in this case. As the cerebellum was involved here, this symptom can be explained on the basis of both, cerebellar and adrenal conditions. Adrenalin through its vasomotor action plays an enormous rôle in maintaining normal vascular tension. When its function is disturbed or diminished, there will be a lowered vascular tonus in the central nervous system, hence asthenia. Abelous and Langlois, in 1891, observed that when double adrenalectomy is performed in animals, death follows promptly, but if even a small portion is left, death does not follow. In the latter case, if the animal is forced to exert itself, the asthenia is exceedingly great. In diseases of the cerebellum, asthenia is one of the prominent symptoms. My patient presented evidences of cerebellar involvement. The asynergia, the asthenia, the diminution of one knee-jerk and absence of the other, were all manifestations referable to the disturbed function of the cerebellum. As the asthenia was here extreme, it is to presume that both elements were here at work.

The entire subject of Addison's syndrome is not altogether elucidated as yet from a pathogenic point of view. Although the clinical picture is well established, all its individual manifestations cannot be satisfactorily explained. The question of melanoderma, for example, is still obscure. While it is true that Semmola and Brault observed melanoderma in a case of compression of the semilunar ganglia and solar plexus, consequently leading to the conception of Addison's disease as being of nervous origin, nevertheless contradictory evidence is also in existence. The same fate affects the exclusive adrenal doctrine with regard to melanoderma as held by some. In view of some affirmative and of some negative findings, the opinion of Lœper seems to be the most probable—namely, that melanoderma in Addison's disease is the consequence of a simultaneous disturbed function of the sympathetic nervous system and of the adrenal bodies.

The case discussed here presents some instructive features. (1) The complete clinical picture of Addison's syndrome; (2) unusually large size of the suprarenals with tubercular contents; (3) the involvement of the spinal meninges, posterior roots and of the cord itself; (4) limitation of these changes to the midthoracic segment of the cord, thus corresponding to the level of that portion of the sympathetic trunk which supplies nervous filaments to the solar plexus, which in its turn serves to form the suprarenal plexuses; (5) a softening in one hemisphere of the cerebellum near the vermis; (6) the case occurred in a negro in whom the melanoderma was of a special character and different from what we observe in a white man. Finally, the case suggests the possibility of a more

frequent involvement of the central nervous system in Addison's disease than has heretofore been reported. Autopsy investigations in this affection should necessarily cover also the domain of the nervous system.

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## THE PORTENTION OF CEREBROSPINAL DISSOLUTION.

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As an introduction to the following innovation, it would be well for us to consider the ever-increasing number of men and women in the wards of our state institutions who owe their present mental and physical incapacity to a disease that is now well known in its etiology and in its deplorable results, and to contemplate the great benefits that would accrue, if it were possible for us to portend and prevent the approach of conditions which render life a burden and death a family disgrace. No doubt many observers have long felt the need of advancement in this important field of investigation and have devoted much time to serious thought in an attempt to amplify our present inadequate knowledge of the manifestations of syphilis in its least active or so-called latent stage. While rapid strides have recently been made in the treatment of this disease in its earlier stages, and most heroic efforts put forth to the rescue of those already within the pale of its inexorable end, it remains no less a fact that the acquirement of knowledge regarding the recognition and treatment of an intermediate or pre-paretic stage has either been long delayed or is tardy in its promulgation.

The term dissolution, as herein employed, is intended to apply only to general paresis, tabo-paresis and tabes dorsalis. While the onset of these incurable maladies is usually so insidious that little or no attention is given their prodrome, it is now well worthy of recognition that *certain definite signs do foreshadow the approach of these dissolutions*, so that we may with a fair degree of accuracy portend their appearance at a period of from one to ten years preceding actual dissolution, and at a time when the condition is still amenable to retardation and curative treatment.

It is only of late that it has been of real consequence, to those afflicted with cerebrospinal syphilis, whether the diagnosis of general paresis or tabes dorsalis was made in their early or late stages. Medication in the past has been of so little value in these conditions that such a diagnosis could afford nothing but mental anguish for those intimately concerned, so that an opinion long deferred was often well justified. Since the introduction and use of salvarsan in the treatment of syphilis, nearly all recent cases have been followed by most gratifying results; therefore, the import of an early diagnosis in all cases of post-secondary syphilis becomes of the first magnitude. If we are to depend upon salvarsan or any other agent

to consummate a cure and to prevent or retard the sequelæ of syphilis, we must also depend upon ourselves as practitioners of medicine to recognize promptly the symptoms that portend the approach of these ravages which so often divest men and women of their integrity at a time in life when by experience and by special training they have often reached their highest degree of efficiency.

While a positive diagnosis of existing *tabes dorsalis* or general paresis is dependent upon the presence of certain physical signs which become pathognomonic only when found associated with each other, it is not essential that this exact combination of signs and symptoms shall exist before a positive diagnosis of impending dissolution can be determined. In fact, any one of the several principal signs of these conditions, when present and associated with two or more lesser signs or subjective symptoms, furnishes reliable evidence of past or present syphilitic involvement of the central nervous system, and should indicate that one of the well-known end-results is prone to follow.

When we realize, as others have, that syphilis in its various stages of development is capable of simulating any and every known disease and still possesses a reserve symptomatology of its own, we cannot but feel the great importance of a more thorough understanding of its symptom-complex, and appreciate the fact that it is upon the general clinician rather than upon the neurologist that the apprehension and arrest of this scourge must devolve. It is to his attention that the ailments common to adult life are first referred, and, simple as they may seem in their meaning and provocation, these vague manifestations often follow one another with sufficient regularity of association to become portentous of impending dissolution.

If we study the pathological lesions of secondary and tertiary syphilis, together with those of *tabes* and *paresis*, and realize the years which usually elapse between the stages of exudation and dissolution, we are impressed with the long period over which gradual degenerative changes have progressed, and with the probability that this series of degenerative changes has not advanced with such stealth as to reach dissolution without producing signs and symptoms indicative of its presence and of its impotent results.

At present it would be impossible for anyone to arrange these signs and symptoms in a manner that would suggest to everyone their relative frequency or importance, for it is upon this as upon other ill-defined branches of medical science that observers differ most widely in their statistics and in their opinions. Consequently these manifestations will be presented in the order which best lends itself to brevity and simplicity of statement. Obviously a paper of this length would not permit of an exhaustive discussion of the many signs and symptoms which portend dissolution; therefore a

general comprehensive review will be made of them as they appear in the three following groups.

## GROUP I.

*Signs Diagnostic of Impending Dissolution.*

- |                                  |   |
|----------------------------------|---|
| (A) Abolition of the knee-jerks. | Impairment of the pupillary light reflex. |
| (B) Argyll-Robertson pupil.      | Irregular pupil.                          |
| Ataxia.                          | Laryngeal crises.                         |
| Epileptoid seizures.             | Speech defects.                           |
| Gastric crises.                  | Unequal pupils.                           |

## GROUP II.

*Symptoms and Conditions Indicative of Approaching Dissolution.*

- |                                  |                                       |
|----------------------------------|---------------------------------------|
| Amblyopia, sudden attacks of.    | Insomnia.                             |
| Burning of toes.                 | Impairment of judgment.               |
| Careless deportment.             | Knee-jerks, unequal or exaggerated.   |
| Choking attacks.                 | Mental depression.                    |
| Contracted pupils.               | Muscular spasms.                      |
| Diplopia, sudden, transitory.    | Numbness and tingling of extremities. |
| Disorientation.                  | Neuralgic or lancinating pains.       |
| Disturbances of hearing.         | Neurasthenia.                         |
| Disturbed sphincter control.     | Psycho-sexual perversions.            |
| Dysphagia.                       | Para-anesthesia.                      |
| Emotional disturbances.          | Paresthesia.                          |
| Exaggerated reflexes.            | Projectile Vomiting.                  |
| Exalted ideas.                   | Ptosis, partial or complete.          |
| Failure of concentration.        | (C) Optic atrophy.                    |
| Failure of memory.               | Swaying sensations.                   |
| General weakness and exhaustion. | Vertigo.                              |
| Headache.                        | Weakness of knees.                    |
| Hypersensitiveness of skin.      |                                       |
| Hippus.                          |                                       |
| Hysteria.                        |                                       |

## GROUP III.

*Conditions often Associated with Late Syphilis.*

- |                                  |  |
|----------------------------------|--|
| Abnormal sexual excitement.      | Gastric-intestinal disturbances.         |
| Albuminuria.                     | Gastric ulcer.                           |
| Aneurysms.                       | Glycosuria.                              |
| Arteriosclerosis.                | Gout.                                    |
| Asthma, cardiac, gastric, renal. | Heel or bone pain.                       |
| Benign growths.                  | Hernias.                                 |
| Cardiac angina.                  | Herpes zoster.                           |
| Chronic constipation.            | High or low blood-pressure.              |
| Chronic indigestion.             | Idiosyncrasy to alcohol.                 |
| Chronic diarrhea.                | Internal hemorrhoids.                    |
| Constant drowsiness.             | Iritis, recurrent.                       |
| Disturbed metabolism.            | Lumbago.                                 |
| Disturbed statics of body.       | Lung conditions simulating tuberculosis. |
| Exhaustion on slight exertion.   | Lost strength.                           |
| Fallen arches.                   |  |



Myocarditis.	Rheumatism, subacute and chronic.
Nephritis, subacute or chronic.	Subnormal temperature.
Offspring, degeneracies of.	Substernal pain.
Onychia.	Sudden loss of weight.
Pain in back.	Skin, chronic affections of.
Paronychia.	Sciatica.
Persistent coated tongue.	Scoliosis.
Persistent cough, non-tubercular.	Varicosities and chronic ulcers.
Recession of the gums.	Valvular heart disease.
Recurrent infections.	Weakness of spine.
Repeated attacks of erysipelas.	

In the first group we have ten physical signs, any one of which should be a warning of grave probabilities, and when associated with one or more signs of the same group, or any two of the next group, becomes strongly indicative of approaching dissolution. Prolonged observations would indicate that signs in Group I seldom appear alone, that they are usually accompanied by several of the subjective symptoms of Group II, and are constantly preceded by a half dozen or more of the vagaries found in Group III.

Group II embraces a number of signs, symptoms and conditions which are usually borne for a time without anxiety, until sooner or later added symptoms impress upon the patient the need of medical attention. Advice upon, or treatment of, any condition named in this group should be withheld until a thorough examination for signs in Group I has been made; also an exhaustive search for any other symptoms or conditions that may be present or have gone before. To calculate accurately the speed of the pupillary light reflex and to compare it with that of convergence and accommodation, together with a study of the excursion and contour of each pupil under dilatation and contraction, a dark-room equipment becomes indispensable, for it is only by employment of such means that these earlier signs of dissolution are detected and the necessity of heroic treatment determined. Eye strain, due to simple or compound astigmatism or an amblyopia of disuse, often causes slight irregularities and inequality of the pupils, but when the difference in size, or deviation from the normal circular contour of the pupil exceeds one millimeter, grave suspicion should be entertained that we are dealing with an irido-paresis, rather than with an error of refraction.

Referring again to Groups I and II, attention is called to the fact that there is no sign, symptom, or condition therein named that is not known to have preceded the appearance of tabes and paresis, in some cases by more than ten years, and in many other cases by more than two years; nor is there a member of either group, with the exception of signs A, B, and C, that has failed to respond to well-directed therapeutic measures and to have remained in abeyance after such treatment in nearly all cases, *without the return of any*

*symptom thus far (a period of from one to two years following the cessation of treatment).* Full doses of salvarsan or neosalvarsan, administered intravenously and repeated at intervals of from one to four weeks until six to twelve doses are given, is the treatment to which reference has been made and from which most remarkable results have followed. The danger of small or infrequent doses is that they are likely to act as a provocative and convert a quiescent process into an active one. If salvarsan is to be used at all in such cases, not less than six doses of 0.6 grm. each should be administered.

Upon a glance at Group III its elasticity becomes apparent. In this group are many conditions which are frequently found associated with late syphilis but are still of unknown origin. Remote as they may seem, from the expression of anything but vague uncertainties, it remains to be proved whether they are spontaneous in their propensity or incognate manifestations of that universal distributor of human ills, the *treponema pallida*.

While there is a multitude of other facts and conditions which lend color in arriving at a final conclusion, emphasis should be placed upon the importance that every physician, interested in preventing tabes and paresis, should make his diagnosis from physical signs and well-defined symptoms, in utter disregard of the lack of venereal history and of negative blood and fluid reactions. If it would be of aid or of moral support to anyone attempting to prevent actual destruction of brain and cord, I would say that experience and observation have taught me to believe that of all cases which have finally reached the stage of dissolution, 90 per cent. in number presented definite diagnostic symptoms years before the final verdict was imposed; and I would add that our present armamentarium against syphilis provides adequate means for its arrest, and offers years of extended health, pleasure and usefulness to those so afflicted.

The question most likely to arise and prove difficult to answer satisfactorily will be: Are we justified in subjecting the patient to such vigorous therapeutic measures before a diagnosis of existing tabes or paresis becomes positive? The reply to this query is everywhere found in scientific preventive medicine. The danger of intensive salvarsan medication should be no greater than that which attends vaccination, antityphoid vaccine injection, or the immunization to diphtheria by antitoxin administration. While it is true that rational medical practice and conservatism are under keen obligation to each other, it often follows that the old standard of conservatism must be revised and a new one established which is consistent with more recent methods and discoveries, and it is only through such a revision that the old 'justification' bugaboo will disappear.

In doubtful cases confirmative evidence will often be obtained by the employment of the therapeutic test. During the past few years mention of this time-honored procedure has almost entirely disappeared from medical literature, but its revival and use are quite certain to follow, for as an aid to a correct diagnosis in the late or pre-paretic stage of syphilis, it is yet of unsurpassed value. Particularly is this true when potassium iodide has not previously been given. The rapidity with which many symptoms and conditions respond to this agent should not mislead us to believe it curative or a preventive of future trouble, for its therapeutic action is usually quite transitory and becomes lessened as the disease progresses.

Failure to mention the significance of blood and fluid reactions would seem an omission of unpardonable prejudice. It is in full recognition of the *great value* of these aids that I would say: In a series of 40 cases of late syphilis, where the clinical diagnosis was of unquestionable certainty, less than 25 per cent. have shown either a positive serum or positive fluid Wassermann reaction. I cannot but feel a profound disgust for the clinician who wantonly disregards or abandons the use of physical signs, to depend, for his diagnosis, solely upon laboratory findings that are often beyond his control, for now as of old, the present condition and past history are recorded in the epiderm, and it is by the aid of this record that the portention of cerebrospinal dissolution is made possible.



## FATAL POSTOPERATIVE PULMONARY EMBOLISM.

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The almost entire safety with which even the most extensive operative procedures can be carried out in our day tends, quite unconsciously, to make the surgeon forget that all the wonderful advances in the surgical art have not been able to eliminate the possibility of certain grave accidents. Even the conscientious surgeon is apt to get into the rut of advising and performing operations without due consideration of these possibilities, until from time to time some tragedy brings him up with a jerk to a realization of the fact that surgery is indeed a very serious business. While such accidents may be reduced to a minimum by good judgment and good technique, it is nevertheless true, to paraphrase an old maxim, that accidents will happen even in the best regulated surgical clinics. Fortunately, the majority of such accidents merely increase the patient's pain or discomfort, or lengthen the period of convalescence from the operation. On the other hand, every surgeon must sooner or later experience that unhappy state of mind which comes when death snatches away a patient upon whom some elective and perhaps very simple operation had been performed.

Of the grave postoperative complications the most common are infection, hemorrhage and embolism. The first two of these are in large measure preventable by proper surgical technique. The prevention of embolism, however, is a much more difficult problem, inasmuch as we are still in large measure ignorant of the factors responsible for its occurrence.

While the writer has seen quite a number of cases of pulmonary embolism during his surgical experience, it is only recently that he encountered his first fatal case. It made a deep impression on him. The following is a brief history of the case.

Mrs. A. S., *æt.* thirty-four, had suffered for four years with occasional but increasingly frequent attacks of typical gall-stone colic. 'Indigestion' was more or less constant, with belching and epigastric distress. The gall-bladder region was sensitive to pressure. In addition, she had had for many years a right-sided inguinal hernia, which was gradually increasing in size. The general condition was good.

*Operation.* Patient entered Mercy Hospital on June 19th, 1913, and on the following day cholecystostomy and herniotomy were performed. The gall-bladder was moderately distended, the walls being only slightly thickened. The omentum was adherent to its under surface. Fifty-three calculi were removed from the gall-bladder and the cystic duct. Most of them were small, the largest being 1½ cm. in diameter. There were no stones in the common

bile duct. Herniotomy by the Bassini method was done for the relief of the right-sided hernia. The operation was a comparatively simple one, requiring only about fifty minutes, the patient leaving the table in excellent condition.

*Death from pulmonary embolism on sixteenth day.* July 4th, the sixteenth day after the operation, the patient was sitting up in a chair when the writer made his visit. The stitches had been removed from both wounds, union being perfect in each instance. She had been allowed to sit up on the fourteenth day, her convalescence having up to this time been uneventful. On this, the third day she had been sitting up, the patient was in excellent condition, laughing and chatting in a lively manner. The gall-bladder was, of course, still being drained. The patient remarked that the dressings were wet from bile, and I suggested that she lie down so that they might be changed. She stepped from the chair to the bed and stretched out. As she did so, the writer heard a loud gasp, and on looking at her, saw that her face was fixed and staring. The pulse had stopped at once, and although she gasped feebly once or twice more, death had evidently taken place almost instantaneously. There was no response to the hypodermic injection of camphor and the various other measures which were resorted to.

Thrombosis, carrying with it the possibility of embolism, may develop after any type of operation. There seems to be a much smaller element of risk in the case of operations in the upper abdomen than in those involving the pelvic viscera. Prostatectomy and hysterectomy especially seem to be fraught with this form of risk. An idea of the frequency of thrombosis as a postoperative complication may be found from the statistics of Schenck,<sup>1</sup> who finds that in 3,204 operations for uterine myoma in twelve different clinics, thrombosis developed in 96, or 3 per cent.

McLean<sup>2</sup> found that of 1,310 laparotomies, 1.9 per cent. were followed by thrombosis and embolism. There were in this series 8 cases of fatal pulmonary embolism, 3 of pulmonary embolism in which the patients recovered, 2 of pulmonary embolism followed by abscess formation with recovery, and 1 of embolism of the liver followed by hepatic abscess and recovery.

Pulmonary embolism, when it occurs after operation, usually does so between the eighth and twentieth day of convalescence. Occasionally, however, the accident may occur during the first week, while on the other hand, its occurrence is sometimes much later than the twentieth day. For example, McLean speaks of a case in which fatal embolism occurred two months after an operation for uterine myoma.

In the majority of cases, fortunately, the embolism is not associated with a fatal termination. It is certain that embolism is often not recognized, more especially when it involves a small vessel or when the embolus is lodged in an organ in which vascular anastomosis is free. The writer will not, in this brief discussion, speak of the symptomatology in cases of non-fatal embolism. The rapidity with which death occurs in fatal pulmonary embolism is quite variable. In a critical analysis of 16 fatal cases, Busch<sup>3</sup> found

that death was instantaneous in one-fourth (4). In the others, ten minutes or more elapsed before death took place. The great amount of study which has been given to the problem of the etiology of postoperative thrombosis and embolism has not as yet resulted in anything approaching unanimity in the views on this subject. It may be stated that the consensus of opinion is to the effect that the factor of greatest importance in the production of thrombosis and embolism is a low grade infection, so slight as to give rise to no clinical manifestations except perhaps a trifling degree of fever.

Other factors on which more or less stress has been laid are trauma, slowing of the blood-stream, and chemical alterations in the composition of the blood. McLean has recently reported experimental observations which seem to indicate that destruction of the endothelial cells is not *per se* a cause of thrombi, but that necrosis of tissue does play an important part. Ribbert,<sup>4</sup> on the other hand, concludes from a study of the long, loose thrombi in fatal cases of pulmonary embolism, that chemical changes in the composition of the blood are chiefly responsible, and that the important factor in their prevention consists in reducing the coagulating power of the blood.

In view of the uncertainty which exists as to the etiology of pulmonary embolism, it is not surprising that no iron-clad rules can be laid down for the prevention of this grave complication. In many respects, indeed, the advice given by authors is very contradictory, especially with regard to the question of the influence of the length of time the patient is kept in bed after operation. Those who advocate early sitting up after operation, urge that early moving about prevents the stagnation of the blood-current, which by some is regarded as of importance in the production of thrombosis. On the other hand, certainly it cannot be denied that such early mobility must increase the possibility of bits of the thrombus being swept away, with the occurrence of embolism. Bearing this in mind, it would certainly seem that there is an element of danger in the present-day tendency to get patients out of bed at an inordinately early period after operation. This is especially true because thrombosis often occurs in the iliac veins and hence may pass unnoticed.

Another controllable factor, which no doubt lessens the frequency of thrombosis and embolism, is gentle handling of the tissues and the minimizing of such operative traumatism as that produced by brutal tugging at retractors. The importance of care in this regard is universally recognized, but not by any means universally exemplified in surgical clinics.

Finally, a conscientious observance of the cardinal surgical principal of asepsis plays probably the most important rôle in diminishing the frequency of postoperative thrombosis and embolism,



in view of what we have said as to the importance of low grade infection in the causation of this complication.

Once extensive pulmonary embolism has occurred, treatment is of little avail, the patient's chances for life being dependent largely upon her general resisting powers, and even more upon the size and location of the embolism. If death does not occur instantaneously, such rapidly acting stimulants as camphor or ether are indicated, while the intense pain and distress often makes the administration of morphine necessary. The plan of operative removal of the embolus, as described by Trendelenberg, has so far been attended by unsatisfactory results. According to Busch, the Trendelenberg operation has so far been performed in 13 patients, but no patient has been saved. One case (Kruger's) lived for five days after the operation, dying of secondary infection.

The purpose of this brief communication has been not so much to discuss the symptomatology or treatment of pulmonary embolism in general as to emphasize the ever present danger of the occurrence of even fatal embolism after any form of abdominal or pelvic operation. Since fatal embolism is, comparatively speaking, an infrequent postoperative complication, it is apt to be overlooked by the surgeon in the consideration of the risks of a proposed operative procedure. Its occasional occurrence, therefore, is all the more distressing.

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# MEDICAL AND SURGICAL PROGRESS.

## ROENTGENOLOGY OF THE BLADDER AND PROSTATE.

### REVIEW OF RECENT LITERATURE.

By E. H. SKINNER, M. D., of the Editorial Staff.

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Both Roentgen diagnosis and therapy are involved in this subject. The diagnostic features will be subdivided into several headings, as follow: Bladder Calculi, Prostatic Hypertrophy, Neoplasms of the Bladder, Seminal Vesicles, Diverticula of the Bladder, Prostatic Concretions. Roentgen Therapy of Prostatic Hypertrophy and Carcinoma of the Bladder will be discussed.

*Bladder Stone.*—In an earlier Roentgen period there were many reports of failure to obtain Roentgen shadows of bladder stones. This was attributed to several reasons—namely, failure to project the shadows of the stone through the dense shadows of the large gluteal muscles by the use of a ray of improper penetration; failure to recognize that a bladder filled with urine may obscure stone shadows; failure to use a compression cylinder and focus the tube in such a manner as to project stone shadows away from the sacrum; failure to demand a thorough cleansing of the lower bowel.

As Kelly states, the Roentgen ray affords positive diagnostic results where all other methods fail sometimes. Especially is this the case where the stone is in a diverticulum. He advises placing the patient upon liquid diet the day before and precedes the examination by a thorough bowel cleansing. The bladder and rectum may both be injected with air during the exposure.

Haenisch states that during the two and a half years previous to his publication, he had not overlooked a bladder stone by Roentgen examination. Not only this, but the method established the number and size of the stones with far more exactness than cystoscopy, and furthermore offered valuable information for the determination of therapeutic measures for relief.

The classical position for plate and tube in Roentgen exposures of the bladder may be taken from Albers-Schoenberg as follows: The patient lies upon the back with the limbs extended; an 8x10 plate is placed beneath the pelvis with the lower edge of the plate



visible between the thighs; the compression cylinder is placed above the upper border on the symphysis pubis and its direction turned obliquely toward the pelvic outlet, the upper border of the lower rim of the cylinder is thereby pressed into the abdomen when compression is applied; the testicles are covered with lead foil. The criterion of a good bladder plate is the clean delineation of the coccyx.

Rafin and Arcelin illustrate a very satisfactory bladder position upon their cystoscopic table chair. The patient is in position for cystoscopy with buttocks at the edge of the table, the knees flexed to a right angle with the feet resting upon a shelf at the height of an ordinary chair, and the patient's back inclined upwards and well supported. The plate is placed beneath the buttocks and the tube centered perpendicular to plate above the bladder area. Compression by means of a Luffa sponge is applied.

Errors in the interpretation of bladder stones have been attributed to the following sources: (1) Dermoid cysts; (2) enteroliths; (3) extra-uterine pregnancy; (4) fruit stones in the bowel; (5) prostatic concretions; (6) bismuth and iodide pills; (7) phleboliths; (8) calcareous deposits in the pelvic ligaments; (9) exostoses upon pelvic bones; (10) sesamoid in the tendon of the obturator muscle; (11) calcareous deposits in bladder tumors; (12) calcareous degeneration in fibroids and myomas; (13) small fecal masses in sigmoid (scybala); (14) atheromatous iliac arteries; (15) injections of iodine preparations in buttocks; (16) calcified glands; (17) epidermal tumors; (18) caseous remains of psoas abscess; (19) prostatic enlargement simulating or obscuring bladder stones; (20) calcareous deposits in seminal vesicles.

Schuetze reports an odd case where a plate of the bladder area, taken in the course of a kidney examination, showed a round shadow with transparent centre at the lower part of the sacrum. Cystoscopy failed to disclose any bladder finding to account for it; there were no symptoms in this part, no calcified myoma. But the patient had been using tampons of iodine, ichthyol and glycerine. The iodine absorption of the mucous membrane about the os uteri was determined as the cause of the shadows.

Nogier offers an original method for differentiating between small bladder stones and pelvic blotches. He takes the first negative with the patient upon the back, plate beneath the buttocks, tube focus directed obliquely toward the feet. The second negative is taken when the patient has been slowly and carefully returned to this same position after lying upon the abdomen and in knee-chest position to dislodge the bladder stone from its position in the neck of the bladder if possible. The two negatives are scrutinized, and if any calcareous shadow has changed in the second negative, it is considered a small bladder stone, and the stationary shadows are pelvic blotches or unmovable accretions in tissues outside the bladder. Rafin and Arcelin differ with Nogier upon this change in position of a bladder stone after body movement, because the stone may have a fixed position or be in a diverticulum. They maintain that even air inflation of the bladder does not always move a free stone.

Wittek was the first to suggest the inflation of the bladder with air to increase the contrast shadows of bladder stones. This method is now quite generally employed.

Burkhardt and Polano offer oxygen gas as a substitute for air inflation, maintaining that there is the possibility of air embolus

where an oxygen embolus would be more easily taken care of by the tissues. There is little danger of this emergency, however. The technique of this procedure will be elaborated under the prostatic hypertrophy heading.

With the bladder filled with air or oxygen, the bladder stones show up with remarkable clearness. The simplicity of the technique should promote its more general use.

Collargol filling of the bladder is sometimes employed. This may either totally obscure stones or the stone may show up as less opaque than the collargol (Rafin and Arcelin). Films, placed in the vagina or rectum, have been employed by Jerie.

*Prostatic Hypertrophy.*—Heyman and Jaches propose the air inflation of the bladder where cystoscopy cannot be employed. Where prostatic hypertrophy is confined mainly to the middle lobe, cystoscopy is impossible because of the hemorrhage provoked by instrumentation. Strictures and false urethral passages also preclude cystoscopy, as does also a debilitated subject with a badly infected bladder.

A medium of air or oxygen intensifies the Roentgen shadows and renders objects clearly visible, which, in other mediums, may be indistinguishable. A small-sized catheter is passed, the bladder emptied and the inflation apparatus attached. An ordinary rubber hand-bulb is used to which is attached a glass bulb filled with cotton to filter the air. The bladder is gently filled to tolerance. Plate and tube having been adjusted, the catheter is removed and air escape prevented by pressure. Patient in ventrodorsal position. Tube focused through 6½ in. diaphragm compressor about 3 in. above the symphysis at an 80° angle to plate. The prostatic shadows are shown within the bladder distinctly.

Burkhardt and Floerchen speak of the difficulty in determining the anatomical relation of the hypertrophied prostate to the bladder. Palpation through the rectum is not completely satisfactory. Sounds reach no conclusions and the most satisfactory method of cystoscopy is denied by the mechanical difficulties of the enlarged prostate at the neck of the bladder. Accidentally they found the value of oxygen inflation of the bladder when attempting cystoscopy with oxygen distention of the bladder in place of fluid distention. *Technique.*—With either an elastic or metal catheter the urine is withdrawn and then the bladder is filled with a boric acid solution. If a double catheter is used, the oxygen is injected and boric solution withdrawn at the same time. The injected fluid having been measured, the double catheter method avoids the possibility of confused shadows from retained urine or blood. Roentgen exposures are made in the usual manner, the plate and tube having been adjusted before the operation.

Resulting roentgenograms show the gas-filled bladder with the prostate projecting into the lighter gas shadow. The illustrations show that the *normal* gas-filled bladder presents a smooth, shallow, oval lower border unlike the collargol filled bladder described by Voelker and Lichtenberg. The sacrum and coccyx appear exceedingly clear. The tuberosity of the ischium projects into the gas outline. The *abnormal* illustrations show the projection of the prostatic tumor into the gas outline below, the middle lobe hypertrophy appearing sharply outlined in the centre. One case had hardly a noticeably palpable enlargement of the prostate, but high degree



of dysuria and retention. The roentgenogram showed an isolated, very contrasting shadow of the middle lobe. This indicated the value of the Roentgen-gas method where one may want to choose between the suprapubic and perineal route. If the suprapubic route is more valuable in middle lobe cases, then the ray could help in planning the operative attack.

Voelker and Lichtenberg used a 2 to 5 per cent. collargol solution to fill the bladder. The exposures were made with the patient upon the back, legs extended and the knees slightly flexed or not at all. They exposed the bladder in a frontal projection. They claim that the normal male bladder is pear-shaped with the large diameter above and the lower part slightly contracted. In prostatic hypertrophy the bladder is not pointed or contracted below, but rather is there a horizontal or concave lower border to the collargol-filling shadow. The whole bladder seems higher than normal. The deformity of the collargol shadow corresponds to the projection of the prostatic mass into the opaque bladder outlines. Sometimes one lateral lobe seems to displace the bladder outlines.

A critical inspection of the illustrations of the articles advocating the various methods of showing the prostatic outlines, rather convinces one of the advantages of the oxygen or air filling. The collargol filling and the bismuth-emulsion filling are best for roentgenograms of neoplasms, diverticula and distortions of tabetic bladders.

*Neoplasms.*—Roentgen shadows in bladder neoplasms may be direct or indirect. *Direct* shadows may be procured of calcareous degenerations of the neoplasm or by the incrustations of urinary salts in and about the tumor mass. *Indirect* shadows may be obtained by insufflation of the bladder with air and oxygen; by the injection of bismuth emulsions, silver salts in solution or other opaque media.

Certain differential diagnostic points are calcareous degenerations in myomas and dermoids which occur in women and therefore are disregarded, inasmuch as the Roentgen method will be used more likely in men. Prostatic enlargements and calcareous deposits in prostates, fenestrated or coral bladder stones, multiple phlebolith shadows, tubercular glands, fecal concretions or small masses in the sigmoid are definite differential possibilities.

The Roentgen method becomes quite valuable in cases which cannot stand cystoscopy because of the hemorrhage provoked by instrumentation, or where there is channeling of the urethra, or where strictures minimize the necessary calibre for the cystoscope. The pain and discomfort of cystoscopy may provoke the patient to procrastinate beyond the time that the superior advantages of direct cystoscopic vision could benefit. In children, unreasonable patients, and weakened individuals, instrumentation is sometimes impossible. Blood and pus in the bladder and enlarged prostates interfere with successful cystoscopy.

Ballenger and Elder report a benign papilloma of the bladder which was recorded upon a Roentgen negative after the bladder was distended with sterilized air. The cystoscopic examination had made the actual diagnosis of the nature of the tumor mass, but it remained for the roentgenographic examination to give evidence that the size of the growth was quite large and scarcely amenable to fulguration treatment as had been planned following the cysto-



scopic examination. Thus, although cystoscopy had returned a diagnosis, the subsequent roentgenogram added the information that the growth demanded extirpation, being too large for fulguration.

Kelly and Burnham report that in bladders choked with papillomata much useful information by injection of bismuth emulsion sufficient to distend bladder but not to overshadow the papillomata shows available space not occupied, and gives relation of sound area to diseased portion. Kelly operated twice in cases which cystoscopically were inoperable from the viewed extent of the disease.

Desnos reports a case where a circumscribed shadow in the bladder was diagnosed as a stone, but it proved to be a malignant tumor which could be only partially removed.

Haenisch reports and illustrates beautifully the roentgenographic records of tumors in the bladder by means of bismuth emulsions. (See citations from Garratt for technique.)

*Diverticula.*—Garratt presents a technique for the bismuth distention of the bladder for the purpose of outlining the bladder as to its (a) position, (b) size and (c) conformation, and that irregularities in the vesicle wall as (d) projection of tumors, (e) diverticula or pouching, and (e) anomalies could be diagnosed and recorded upon Roentgen plates for permanent record. Garratt's technique is as follows: Pass a sterile, soft catheter and irrigate the bladder with boric acid solution. When the washings come away clear, measure its capacity, then with the bladder empty, distend with the measured quantity of the following solution:—

Bismuth subcarbonatis .....	50 grm.
Kaolini. . . . .	250 grm.
Aq. dest. . . . .	1000 grm.

(Formula of Haenisch, of Hamburg, Germany, and used by him in examination of the large intestines.)

Take at least two roentgenographs, one in the ventral recumbent position with the anode centered over the sacrococcygeal articulation; this should be a standard exposure for the bladder, always preserving the same distance from anode to plate. Center as above, and a roentgenograph will result from which reliable comparison as to size, position and conformity can be made. The second exposure can be taken at any desired lateral or dorsal angle. The proper angle found, stereoroentgenographs would be of great value.

The bismuth solution is well borne by the bladder. In one patient with cystitis it was the only injection which he could retain with comfort. The solution can be removed by irrigation after the exposures have been made, or allowed to pass off naturally. The danger of bismuth poisoning from absorption is practically nil.

Lerche reports a case where cystoscopically he discovered a small orifice of a diverticulum into which he could not introduce the cystoscope. He injected the bladder with 100 c.cm. of collargol, 5 per cent. With the Roentgen plate at the back, patient prone, and tube focus directly above the bladder, there was no resulting shadow of the diverticulum. The patient was rotated slightly to an angle of 35° with the plate, and the diverticulum was shadowed upon the plate.

*Seminal Ducts.*—Radiography of the seminal ducts has been pursued and reported by Belfield. He has injected them with 5 per cent. argyrol solution through a small catheter introduced through a

vasotomy incision. Much interesting physiological and pathological information is reported by Belfield. Thomas and Pancoast believe that the medical profession would be amazed, if not embarrassed, to learn how frequently in certain infective, cryptogenic, nervous and arthritic conditions, the depot of infection will be found in chronic seminal vesiculitis. They recommend the injection of collargol by vasopuncture rather than the more formidable vasotomy of Belfield. They consider this procedure of therapeutic as well as diagnostic value, and state that collargol radiograms in a series of normal and pathological cases have demonstrated, (a) by comparison *in vivo* and *in vitro*, the graphic portrayal of an ejaculatory duct sphincter; (b) the intimate relationship between the ureter and seminal vesicle, whereby ureteral irritation and urinary obstruction may occur in the event of an enlarged and inflamed vesicle; (c) the presence of stricture or obstruction of the vas; (d) congenital anomalies of the vesiculæ seminales; (e) inflammatory enlargements of the vesicles, especially loculated collections of pus or seminal pyovesiculitis.

Fraenkel has reported Roentgen shadows of calcareous deposits in the seminal vesicles which should warn one against misinterpretation. These shadows are usually symmetrical and bilateral.

*Prostatic Concretions.*—Forsell and Albers-Schoenberg have reported extensively upon this condition. Previous to their Roentgen delineation this was considered quite rare, but it is now known that the condition is not infrequent and symptoms similar to prostatitis and prostatic hypertrophy may be occasioned thereby. He insists that their Roentgen shadows are more easily obtained if the compression cylinder is turned quite oblique to the prone patient and directed sharply toward the feet, so that the resulting negative shows the obturator foramen as a mere slit and the symphysis pubis projected far below the prostatic area. The concretions are usually of rice size and grouped together in the lateral lobes of the prostate.

*Roentgen Therapy.*—The Roentgen ray has been applied therapeutically for prostatic hypertrophy and as a postoperative measure in carcinoma of the bladder.

There have been isolated reports upon the use of roentgentherapy in cystitis, urethritis, but these will not be given the benefit of a serious report. Mechanico-therapeutical measures of every sort are resorted to by some general practitioners, and just because these physicians take their work seriously, there is no good reason to believe that such methods will survive beyond the time when some other newer spectacular method becomes popular.

*Prostatic Hypertrophy.*—Hunter gives a review of the subject to 1911. He reasons that treatment of prostatic hypertrophy by the Roentgen ray is closely akin to that used in exophthalmic goitre, it being largely a question of histological structure of the gland. If the growth is due to a simple hyperplasia of the epithelial and glandular tissue we may expect results, but if there is much increase of muscular and fibrous tissue, it is only by the greater contraction of these tissues that relief can be secured. These latter tissues do not yield readily to Roentgen influence.

Hunter reports 7 cases of his own, some of which showed marked relief. He offers quite reasonable conclusions—namely, the Roentgen ray is a valuable treatment; there is no question of mortality; if there is improvement it is rapid and if no improvement occurs, in a reasonable time, other measures may be considered.



Hunter's technique consisted of applying a medium hard ray through leather filters upon the perineum and scrotum until a full erythema dose was given. A divided dose-technique was pursued.

Wilms and Posner contend that prostatic hypertrophy depends probably upon changes in the internal secretion of the testicle, just as uterine myomas depend upon changes in ovarian secretions. The anatomical similarity between prostatic hypertrophy and uterine myomas prompts them to recommend roentgentherapy, which alters the secretions of the testicle and ovary and thus promotes recession in the prostatic and uterine enlargements.

Ehrman reports good results in a case of hyperplastic prostate and a failure in a large fibrous prostate.

Haret reports good results after the third treatment usually. He insists upon hard rays, 8 to 9 Benoist scale,  $\frac{1}{2}$  mm. aluminum filter and weekly applications of 3 Holzknecht units.

Namenow offers contradictory evidence against the claims of Wilms and Posner regarding the similarity of the prostate to the uterus. He does not believe that Roentgen castration is of much benefit, and has exposed the testicles of animals to severe Roentgen doses without any appreciable change in the prostate. These were, of course, healthy animals. The testicles became markedly atrophied.

*Carcinoma of the Bladder.*—Gray reports a case of bladder carcinoma which was removed by a suprapubic incision, following which the Roentgen ray was applied through a speculum introduced into a large drainage opening. The only details of the treatment consist in the testimony of 21 therapeutic exposures followed by healing of the bladder wall involved and the closure of the suprapubic incision by granulation. The patient was reported as perfectly well one year later.

Undoubtedly there will be many reports forthcoming upon the influence of deep roentgentherapy upon carcinoma of the bladder. The ability to introduce by the cross-fire method large doses of hard rays with the new gas and pure electron tubes, will provoke more attention to the thorough postoperative roentgenizing of bladder tumors.

There have been quite a few reports by French and German radium enthusiasts upon the use of radium alone or in conjunction with Roentgen rays for prostatic hypertrophy and carcinoma. These reports, as yet, fail to announce any cures. They do demand recognition of the amelioration of symptoms and pain. Some may advance a pessimistic opinion that these symptoms are frequently relieved by the proper attention to hygiene that the new treatment forces upon the patient.

We cannot close this review without speaking of the splendid diagnostic textbook by Legueu, Papin and Maingot. While it has not been used very much in evolving this review, one could probably have secured about the same information by sticking to this one book. The illustrations are good. Quite original effort is displayed in the study of bladders after prostatic operations and in the estimation of retention before operation. The clinical and operative pages of the book are full of a new type of information. This information concerns the pathological interpretation of roentgenograms. One realizes that there was a harmonious enthusiasm shared by the three men who collaborated this book.



## DIAGNOSTIC AND THERAPEUTIC NOTES.

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ACIDOSIS IN PREGNANCY.—Murray (*Brit. Med. Jour.*, January 23rd, 1915). It is probable that the condition known as acidosis plays an important part in the toxemias of pregnancy, whether they show themselves as vomiting or as eclampsia. The early recognition of this condition and an estimate of its degree is thus all-important. For this purpose the author suggests that the tolerance of the body for alkalies may be used as a test. The greater the degree of acidosis, the more avidly any alkali introduced from without will be absorbed and vice versa. Expressed differently, if the body is in no need of fixed bases, any alkali introduced will be eliminated and the urine will become alkaline. On the other hand, if there be a need for fixed bases, when alkali is introduced, it will remain in the body, and the reaction of the urine will remain unchanged.

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TYPHOID VACCINE.—Kisskalt (*Deutsch. med. Wochenschr.*, 1915, No. 14). Typhoid vaccine, as prepared at present, consists of a suspension of the bacilli, killed by heating to 55°, and preserved by the addition of 0.5 per cent. phenol. It has long been known that heating the bacilli interferes with their immunizing power, less at 55° than when a higher temperature is used, but noticeably even so. The author has found that the use of heat is quite unnecessary, as the addition of the 0.5 per cent. phenol alone kills the bacteria. At room temperatures, three days or less are required to produce a sterile suspension; in the incubator, twenty-four hours invariably suffice. Vaccines so obtained are much more potent than those in which heat is used. This applies, however, only to typhoid or coli vaccines; cocci are not killed by the dilute phenol.

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TREATMENT OF TYPHOID FEVER.—Luedke (*Muench. med. Wochenschr.*, 1915, No. 10). The author advocates the intravenous use of albumose in the treatment of typhoid fever. Twenty cases were so treated. Of these, 7 responded by a critical fall of temperature, immediately after the injection, followed by uneventful recovery. In 3 other cases, the temperature became normal within a few days, while in 19 cases altogether a beneficial influence of the injection could be made out. The rapid disappearance of the fever was accompanied by a corresponding cessation of the other signs and symptoms.

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TREATMENT OF ABSCESES.—Tiegel (*Arch. fuer klin. Chir.*, Vol. 106, No. 2). After incision, the writer replaces the usual tampon or drain by the introduction of a small apparatus, which, by means of a spring, holds the wound wide open. The abscess heals more quickly, better functional results are obtained and the method is much less painful than the usual one.

PROPAGATION OF PURE VACCINE VIRUS.—Noguchi (*Med. Rec.*, May 1st, 1915). The prevailing method of vaccine preparation in the present day consists in collecting at an appropriate moment the virus from the vaccinal eruptions on the skin of the calf and then subjecting the raw material to the bactericidal effects of certain chemical reagents (glycerine, phenol, etc.), which do not impair the virus itself to a serious extent. By this treatment the contaminating bacteria are so reduced in number and kind that the material is now considered ripe for practical use. The method requires stringent precautions in order to produce a model vaccine, and no product is regarded as ready for use before it has been left in contact with the chemical (glycerine) for a month or longer. It is evident that much labor and care can be spared if a method is found by means of which the virus can be propagated directly free from bacterial contamination.

This problem has engaged Noguchi's attention for the past year and he has succeeded in propagating pure vaccine virus in the testicles of the rabbit and calf which is absolutely free of bacteria and preserves its virulence undiminished.

The testicular cultures of vaccine virus exhibit all characteristic properties of the skin-propagated virus. The two varieties of virus are indeed indistinguishable in their action upon the skin and cornea of rabbits and the skin of calves. Moreover, the rabbit testicular strain of the virus, free from all bacteria, produces typical vaccinal effects in human subjects in whom are eliminated the secondary local and general reactions due to bacterial association with the skin virus.

The full paper dealing with this subject will appear in a forthcoming issue of the *Journal of Experimental Medicine*.

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A NEW TUBERCULIN.—Croftan (*Brit. Med. Journ.*, April 10th, 1915). Some years ago the author discovered that tubercle bacilli would dissolve in benzoyl chloride, and that this solution produced very marked focal and general reactions in tuberculous patients. When using it for therapeutic purposes, the initial dose had to be very small—0.0000001 mgrm. in lung cases, and 0.000001 mgrm. in extra-pulmonary cases. The highest dose that had to be attained was 0.01 mgrm. The clinical results have been so satisfactory that the author now uses no other for therapeutic purposes. The doses are increased as follows: 0.0000002, 0.0000004, 0.0000006, 0.0000008, 0.000001, and so on. The dilutions are made in liquid paraffin, containing 2 per cent. benzoyl chloride, and the author generally adds 0.032 gram iodoform dissolved in ether, so as to combine immuno- and chemo-therapy. For prophylactic purposes the initial doses may be larger and the rises more rapid.

# SUPPLEMENT

ON

## ROENTGENOLOGY

(ISSUED QUARTERLY)

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PHYSICS OF ROENTGEN RADIATION WITH REFERENCE  
TO TREATMENT.\*

It is indeed a great pleasure to have an opportunity to speak tonight in appreciation of the genius you are here assembled to honor. As a humble representative of the science enriched by Roentgen's labors I may safely assert that no discovery of modern times has had such far-reaching effects in physical and chemical science as the one we are gathered to celebrate.

Yet as in the case of many other discoveries, not even Roentgen realized the full importance of his observations or the extent of their applications. Many valuable suggestions were embodied in the original memoirs of Roentgen, which I trust may be read as an inspiration by all of you, either in the original or in translation, yet I do not recall any mention of the probable effect of this radiation on vital processes. It was already well known that radiant light and heat and even ultraviolet radiation modified cell production or repair, and it was only natural that the physician should anticipate aid from this new source in his struggle for the mastery of disease. It might also have been anticipated that such a study would be attended by great difficulties and that the results would be variable and in some degree uncertain so long as no method of measurement for such radiation was forthcoming.

Dr. Coolidge has mentioned the possibility of building up molecules or atoms by a reversal of the forces now used to disintegrate or tear down such natural structures. In brief he intimates that the dream of the Philosopher's Stone may not be so remote as we have been wont to believe. Although cell structure is ever changing and in the highest degree complex, controlled by forces not as yet known, why may we not add to our modified or scientific dreams one of control over cell growth? What might we not accomplish if we could not only transmute the elements but *ungrow* animal and vegetable life, verily an Elixir of Life.

Turning from such iridescent dreams to things more certain of realization we may well ask what part the physicist and the engineer may be expected to take in the development of therapeutics. In order that rational information may be available in the study of the physiological effects of this radiation, we must know how to

\*Abstract of Remarks made at the Meeting of the Roentgen Ray Association of Greater New York, Commemorative of the Twentieth Anniversary of the Discovery of the X-Ray, New York, May 5th, 1915.

produce the exact quality of radiation required and how it is to be measured. The mode of production and its control have been greatly improved by the work of Coolidge, and it remains to study with unusual care the phenomena of absorption, of transformation, of scattering and of secondary radiation in the tissues and cells. The medical profession have a right to expect the same attention to this problem that has been given to the study of light production, distribution and quality.

There has hardly been time since the advent of the new tube to clear up the many points of physical difficulty in the study of this radiation. Yet one should by no means be discouraged, as all progress in radiation measurement has been slow. We still find the measurement of light a troublesome matter.

I am sure that we may in the near future be able specifically to direct the roentgenologist in the production of the desired quantity and quality of radiation and to measure in a rational manner. Only when this is done can the results by one man be compared with those of others or can any one be sure of repetition of results from day to day.

It seems to me that it is time to use the methods of the great commercial laboratories where *all* the known sciences are utilized in the solution of their problems. We must ignore those accidental boundaries separating one science from another and give each to the other our best efforts and thoughts.

In conclusion may I express the hope that you may all consider well the work of the investigator in all fields of natural phenomena. Roentgen was not consciously striving to cure disease; he was anxious to know more of radiation; and all these wonderful advances were by-products. Had he started out with the practical problem of looking through flesh and bone, I greatly fear he would never have made this great discovery. May not then all investigators expect, not simply tolerance, but active support to the end that through a more complete knowledge, disease and suffering may be banished from our midst? Surely, no problem is more worthy nor should any receive a greater share of scientific attention.

J. S. SHEARER,

Professor Department of Physics, Cornell University.

## HIGH-POWERED ROENTGENOLOGY.

It has only lately become possible for roentgenologists to obtain tubes of high power from the manufacturer. This is the result of an evolution in manufacturing which began when the manufacturers of transformers started to produce apparatus of unusual capacity. It has been for many years a complaint of these manufacturers that the makers of tubes were not able to keep pace with the increasing capacity of transformers. The gas tube and the pure electron tube are so much in advance of all that the transformer manufacturer demanded that the tables may fairly be said to be turned in that respect.

This evolution is one that is only the reflection of the progress in the construction of high-powered engines for automobiles and high speed motors for aeroplanes. The results of the increased efficiency in these engines is one that contains a useful lesson for the roentgenologist. Mere possession of the high-powered machines does not mean that the possessor is capable of using his high power intelligently.

Capacity to apply high power is the essential element to success. High power in apparatus usually carries with it an additional burden in that its dangers are increased directly proportional to the addition of power. There is great satisfaction in the possession of high power, but its pleasures carry with it a responsibility, which should inculcate a reluctance to display the power and a courageous timidity in its application.

The high-powered transformer and the high-powered tube are available to the expert and the novice alike.

Now the public demands in many other situations that the pilot of a high-powered ship or the driver of a high-powered automobile should be experienced in small things and examined as to his knowledge of big things before he is entrusted with such increased responsibilities.

Inasmuch as there is no legal criterion or censorship in roentgenology, it is necessary to depend upon the conscientiousness and mental virility of its advocates to protect their patients against the inherent dangers of modern high-powered Roentgen apparatus.

What a gigantic responsibility this places upon laborers in the Roentgen field! While nearly all other branches of business and medicine are laboring under the restraint of government commissions, legal restrictions and press publicity, the Roentgen neophyte and savant alike follow their own inclinations, and the patient trustingly endures. Every Roentgen worker should, therefore, use his high power sparingly and intelligently. He should see that he is well protected and that his patients are guarded against any emergencies that might arise.



Let the possession of high power be balanced by courageous discretion and intelligent application.

E. H. S.

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#### ERRATUM.

In the Report of the Meeting of the Eastern Section of the American Roentgen Ray Society, at Atlantic City, January 29th and 30th, which appeared in the Supplement on Roentgenology of the JOURNAL for March, the following remarks were attributed to Dr. Henry K. Pancoast, of Philadelphia:—

The discussion of the "Roentgenologist and the Hospital" was opened by Dr. H. K. Pancoast, of the University of Pennsylvania Hospital, Philadelphia. He stated that he found it advantageous to have fixed portions of each day devoted to the examination of three classes of patients—(1) Ward patients; (2) private room patients; (3) private out-patientz. The roentgenologist fixes the fees, of which the hospital retains one-third. The hospital pays all expenses of installation and maintenance.

Dr. Pancoast has written us that his remarks were wrongly transcribed and that the above paragraph contains a number of mis-statements of facts. He has written the following paragraph in correction of same:—

"The hospital ward and dispensary patients, and also my own private patients, could be examined at fixed times of the day, so as not to conflict. All gastro-intestinal cases had to be examined at certain definite times, but no difficulty was experienced in keeping them separate. The hospital has nothing to do with fees of private patients, any more than they would if these patients were seen in my own office, although I was quoted as stating that the hospital takes one-third. The fees from patients occupying private rooms in the hospital are fixed by the roentgenologist and the hospital collects all such fees and retains one-third. The hospital *does not* pay all expenses of installation or maintenance. Last year the roentgenologist paid, at least, one-half the running expenses of the laboratory. He has absolute charge over *gastro-intestinal* cases while under examination and all cases under treatment."

## ORIGINAL ARTICLES.

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### THE NECESSITY FOR A CONSTANT TECHNIQUE IN ROENTGENOGRAPHY OF BONE AND JOINT LESIONS.\*

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By JAMES T. CASE, M. D., of Battle Creek, Michigan,  
Assistant Surgeon and Roentgenologist to the Battle Creek (Michigan) Sanitarium; Professor of Roentgenology, Northwestern University Medical School, Chicago; Attending Roentgenologist, St. Luke's Hospital, Chicago.

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Roentgenograms are in reality only shadow records of varying density and disproportion, and hence they do not always depict the parts studied in their actual size or in their true relations. The factor of disproportion may be practically eliminated if the source of  $x$ -ray be placed at a sufficient distance from the part studied so that the rays which pass through the part to the sensitive plate are nearly parallel (parallel projection); but, for practical purposes, this is not feasible, for it would involve placing the Roentgen tube far from the plate at a distance varying from one to two metres (teleroentgenography). This is readily understood when it is remembered that the Roentgen rays originate at a small point on the target of the tube, spreading out from this source in straight lines through space in so-called 'central projection,' with the result that the greater the distance of the plate from the subject or part, or the nearer the tube to the subject or part, the greater the distortion and disproportion in the resulting shadows.

The perspective disproportion becomes greater the more obliquely the rays fall upon the plate; in other words, the further a part of an object is removed from the Roentgen ray vertical to a plane parallel to the plate, the greater the distortion and disproportion. It is therefore of prime importance that the part to be rayed shall be placed as near the plate as possible, and the tube at such a distance from the plate that the rays which mark the contours of the investigated area (the tangential rays) shall fall upon the plate as nearly vertically as possible.

It is at once clear that a globular body may cast an ovally distorted shadow with oblique irradiation. This is observed in studies of the femoral and humeral heads, where it is therefore important that the central ray should fall directly upon the head of the bone.

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\*Read by invitation before the American Association of Railway Surgeons, Chicago, October 14th, 1914.

In bodies or parts of irregular shape the amount of disproportion can be less readily estimated with accuracy, especially when the diameters in question run obliquely to the plane of the plate, as, for instance, the lower jaw. The silhouette of some bones is complicated by the fact that some portions are depicted in the transverse section, as, for instance, the skull and the long bones. The same is true of the zygomatic arch in frontal roentgenograms of the cranium: the insertion at the upper jaw is seen in transverse section, while the remaining parts of the arch are seen in longitudinal projection. And so one might describe at length the instances of disproportion and their causes. The cartilages of the epiphyses register a double line when seen in transverse projection. Especially complicated is the varying disproportion to be seen in an anteroposterior roentgenogram of the spinal column, the lumbar region for instance. The intervertebral space upon which the nor-

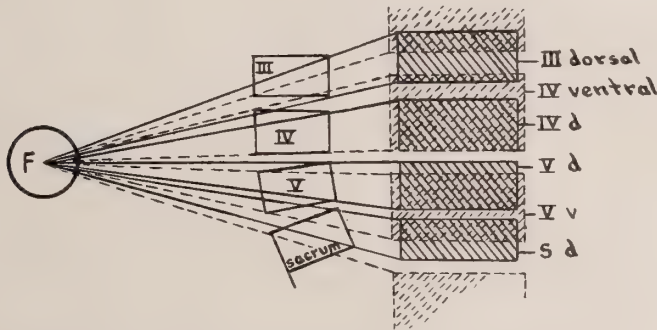


Fig. 1.—Diagram illustrating the structure of the shadow-record of the lower spine in an ordinary anteroposterior roentgenogram. The only clear interspace is that between the bodies of the fourth and fifth lumbar vertebrae (Grashey).

mal ray falls remains quite clear, while the intervertebral spaces in the path of obliquely falling rays overlap with resulting distortion of shadows, the disproportion becoming greater the more oblique the illumination (Fig. 1).

Under certain conditions the perspective disproportion which results from oblique illumination of the part can be corrected. If the part is sufficiently thin or mobile so that fluoroscopic screen manipulation is possible, then screen observations at various angles and with varying intensity of illumination will enable the observer to correct the distortion produced in the single roentgenogram. But even at this date, when fluoroscopic work is fast regaining favor under conditions of relative safety afforded by modern protective devices, wisdom overrules valor in demanding that screen work be minimized, employing roentgenography whenever fluoroscopy is not absolutely demanded. Furthermore, it is quite possible



to overlook a certain class of fractures attended by little separation of fragments and no deformity; fluoroscopy is not feasible for making negative diagnoses of injury to the larger joints (hip, shoulder, etc.); and fluoroscopy leaves no permanent record for future comparison. Therefore, in marked contrast to *x-ray* studies of the chest and abdomen, particularly of the alimentary tract, it may be stated as a maxim, that fluoroscopic screen studies are not suitable for the investigation of bone and joint injuries, at least in excluding injury. On the other hand, fluoroscopy may serve an extremely useful purpose during the setting of fractures, by giving the surgeon a 'moving picture' guidance, provided he has available the means of setting the fracture under the fluorescent screen.

Diagnostic errors due to misinterpretation of roentgenograms are likely to occur under varying circumstances, but they are especially liable to occur when the one who attempts to read the plate is not familiar with the technique followed in its making. In spite of splendid contour and apposition of fragments in long bones, it is possible to secure a roentgenogram which will make it appear that there is a deformity, and vice versa it is possible so to manipulate the part in relation to tube and plate as to make it appear that there is little deformity when in reality there is poor apposition of fragments. It is possible by placing the tube to the ulnar side to exaggerate the normal convexity of the radius, and to make the bowing less apparent by the opposite procedure.

Pirie has called attention to the fact that under certain circumstances which the writer will illustrate with slides, the shadow of the head of the humerus may be made to show an area of apparent rarefaction suggestive of myeloid sarcoma, while with the arm in a different position this appearance is absent.

Again, in dealing with an oblique fracture of the lower end of the radius downward and backward without deformity, the fluoroscopic examination is not likely to reveal the lesion unless it happens that the tube is so placed that the normal ray traverses the radius in the plane of the fracture. If deformity exists, the extent of the deformity or over-riding may be exaggerated or diminished at the will of the examiner by placing the tube proximal or distal to the lower end of the radius.

The errors that occur in the interpretation of roentgenograms depend upon variations in tube-plate, tube-body, and body-plate distance; upon variation in the angle of incidence of the normal ray, due to moving the tube laterally, or distally, or proximally from the position where the normal central ray falls vertically upon the centre of the plate; and upon variations in the anatomical relations of the part studied. This latter factor may be due to restraint placed upon the patient by dislocation, separation of frag-

ments, pain, etc., which prevent him from placing the injured part in the position usually accepted as the constant.

For instance, if a roentgenogram of a fractured humerus made with a target-plate distance of sixteen inches be compared with a post-operative roentgenogram of the same arm made with a target-plate distance of twenty-six inches, there will be an apparent shortening of the bone which does not exist and would not appear were the post-operative study made at the same target-plate distance as the original roentgenogram.

Again, it is well known that the intensity of the rays emerging from a tube at right angles to the anode-cathode plane (the normal ray) is much greater than that of the rays in the periphery of the active hemisphere of the tube. Hence it is evident that more ray is transmitted through parts of bone directly in the line of the normal ray than passes through an equal density of bone when illuminated by rays from the periphery of the active bundle emanating from the target. Failure to recognize this fact might lead to false interpretations as to the relative density of the bones in a part, with consequent erroneous diagnosis. And yet it is extremely important to make a careful estimate of the bone density, for thus one not infrequently recognizes in an injured part an unsuspected metastatic carcinoma which reveals itself by a localized decalcification of the affected bone.

If one attempts to correct the possible error under these circumstances, by comparing the roentgenogram of the injured part with that of the sound part, it is of the highest importance that the roentgenogram of the normal part should be made with exactly similar technique. Therefore, if the patient by reason of pain, dislocation or deformity, cannot place the injured part in the position accepted as the constant, it is important that the roentgenogram of the normal part for comparison be made, not in the normal or standard position, but in the position the patient was obliged to assume for the injured part.

Many of the disadvantages incident to the inherent disproportion in the shadows recorded on roentgenograms are overcome altogether, or at least minimized and unified, by the adoption of a constant technique in roentgenographic work. It is not sufficient that each individual roentgenographer should adopt a technique which is uniform in his own practice, but different from that of other x-ray workers, but the various men responsible for x-ray work should seek to employ the same standards as to target-plate distance, quality of tube, angle of incidence of rays, and especially the disposition of the part to be rayed. The slides about to be thrown on the screen illustrate some of the more important positions for ankle, knee, hip, shoulder and elbow work, which seem suitable for adop-

tion as part of a standard technique. A description of some of these standard positions follows later in this paper.

More important yet, it appears to the writer, is the adoption of the stereoscopic method, which at once does away with most of the disadvantages which have thus far formed the subject of this paper. It is true the stereoscopic method involves the making of two plates, but two plates are usually required anyhow, one in each direction. The added trouble is very small, the time consumed is very slightly longer, whereas the result is a true *picture* of the part under investigation. The ordinary roentgenogram, as above noted, is simply a flat shadow record of varying density and disproportion, giving no idea of depth; the stereoroentgenogram, on the other hand, is a true, three-dimension picture, in which all the disproportion and overriding of shadows is corrected. One appears to be looking *into* the part, not *at* it. Depth is apparent, and, if one records and uses in viewing with the stereoscope the target-plate distance, it is possible to measure accurately the third dimension from the stereoscopic plates. Localization of foreign bodies may be carried out in this manner with absolute accuracy. There is a wealth of fine detail in stereoroentgenograms not to be made out by the most careful scrutiny in the single plate. Stereoroentgenograms are always comparable, one with another, even by physicians who have no knowledge of the exact technique employed in the making of the plates, for the stereoscopic plates themselves reveal what must have been the position of the tube in relation to the parts.

The writer, therefore, strongly recommends the uniform adoption of the stereoscopic method wherever it is feasible. Only slight and relatively inexpensive additions to equipment are needed to permit this kind of work. In fact, by a little extra care, it is possible to make very serviceable stereoroentgenograms of the various bones and joints with an ordinary portable coil and wooden tube-stand. Especially when dealing with small parts, as the hand, the wrist, the elbow, and the ankle, for example, it is possible to make two stereoscopic exposures side by side on a single five by seven inch plate, viewing the stereoroentgenogram thus produced, in an ordinary hand stereoscope, such as the writer will pass around in a few moments. Larger plates are, of course, needed for properly depicting some of the parts just mentioned, but the additional stereoscopic study, possible with such little effort, is very helpful.

It is furthermore impossible to make plates of the shoulder or the hip in two directions, and often very difficult to make them laterally in injuries of the lower spine and sacrum, especially of the sacro-lumbar and the sacro-iliac joint. It is imperative in studying these parts that stereoscopic studies be made. In fact, with the possible exception of the long bones where roentgeno-



grams in two directions are nearly always possible, the stereoscopic method is preferable for all joint and bone lesions. A constant standard of technique in the making of the single plate, as well as in the stereoscopic method, is the solution of the difficulties arising from errors in the interpretation of Roentgen plates.

The following is a brief description of some of the standard positions for extremity work. The limits of this paper will not permit more than a brief description.

*The Hip-Joint.*—The hip roentgenogram should always be made stereoscopically. With the patient lying flat upon the back, the tube should be centered over a point in Poupart's ligament, midway between the anterior superior spine of the ilium and the pubic spine. Two exposures should then be made, one with the tube an inch and a quarter internal, and one with the tube an inch and a quarter external to this point. The tube-holder should be tilted slightly with each exposure so that the central ray will fall exactly at the middle of the plate-holder, which is placed underneath the hip-joint.

In thin individuals, it is a good plan to use a sufficiently large plate to include the entire pelvis. With hip fractures there is often an injury to the bones of the pelvis which would be missed if one used too small a diaphragm. In heavier individuals, where a small diaphragm is essential for good roentgenographic results, several roentgenograms should be made covering the entire pelvis. The writer has seen a fracture of both rami of the pubic bone on one side when a fracture of the other hip had been suspected.

It was formerly the custom to include both hips on the same plate. This is hardly necessary these days when there are in print so many atlases of the normal. If both hips are wanted for comparison, better results are obtained by using two smaller plates, making separate exposures for each plate according to the technique just described, than by using a single 14x17 plate and one exposure.

In studying the hip it is always important that the feet should be placed with the toes pointing directly upward. This effect may be secured by strapping the foot in the right angle foot-holder there shown.

*The Knee.*—The knee-joint may be studied in five or six directions. Ordinarily one makes a postero-anterior and a lateral roentgenogram. In certain other instances, the anteroposterior plate must suffice, particularly where the patient has been badly injured and cannot be turned upon the face. Stereoroentgenograms are not so essential in knee examinations as in the study of the hip and shoulder, where their use is imperative. Knee-plates in two directions usually suffice.

The postero-anterior roentgenogram, that is, with the patient prone, patella upon the plate, the ray passing through the knee

from behind forward, is preferable (Fig. 2). The rays should enter from an angle slightly below the patella. Whenever possible, the patella should be next to the plate. If, for any reason, the patient cannot be moved, it is sometimes necessary to make the plate anteroposteriorly. If so, the patellar shadow is much enlarged and its finer detail is lost.

Lateral plates may be made with the plate internal or external to the knee, as the circumstances demand. The writer's custom is to place the plates against the internal aspect of the knee-joint. This position is secured with the greatest ease and comfort to the patient by making a tunnel platform which fits down over the op-



Fig. 2.—The proper position for a postero-anterior roentgenogram of the knee-joint.

posite leg. The knee to be examined is placed upon this platform in the manner shown in Fig. 3.

If the suspected focus of disease or injury is external, the roentgenogram may be made with the plate external in the manner shown in Fig. 4. In this exposure, the central ray should enter the knee in such a manner as to throw the patellar shadow clear of the knee-joint.

Oblique illumination of the knee is sometimes very helpful. The oblique illumination may be made in several directions.

In lateral studies of the knee-joint, it is sometimes inadvisable to turn the patient, especially when there has been a fracture. Under such circumstances, the roentgenogram may be made as shown in Fig. 5, the knee being placed within a right-angled plate-holder, the plate being held vertically to the inner side of the knee.

The tube-holder is so adjusted that the tube is placed sideways, the rays traversing the knee laterally.

*The Ankle.*—An adequate study of the ankle-joint requires three roentgenograms, one stereoscopic pair laterally and one single plate

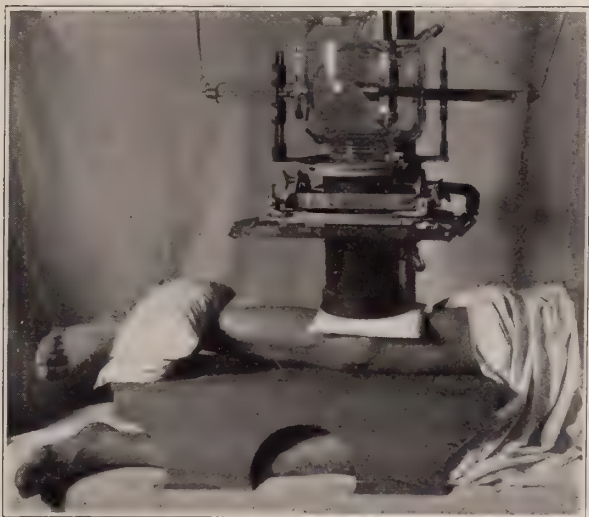


Fig. 3.—Tunnel-platform for lateral roentgenography of the knee-joint.



Fig. 4.—Position for tibiofibular roentgenogram of knee-joint (plate external).

posteriorly. For the posterior plate, the exposure should be made with the leg resting on the long arm of a right-angled foot-holder in the manner illustrated in Fig. 6, the foot being held in place by a few turns of an ordinary bandage. The central ray should enter



the ankle at a point about one inch above the centre of a line joining the tips of the malleoli. The tube should be tilted slightly downward in order that the central ray may traverse the clear space of the ankle-joint.

Lateral roentgenograms of the ankle are best made with the

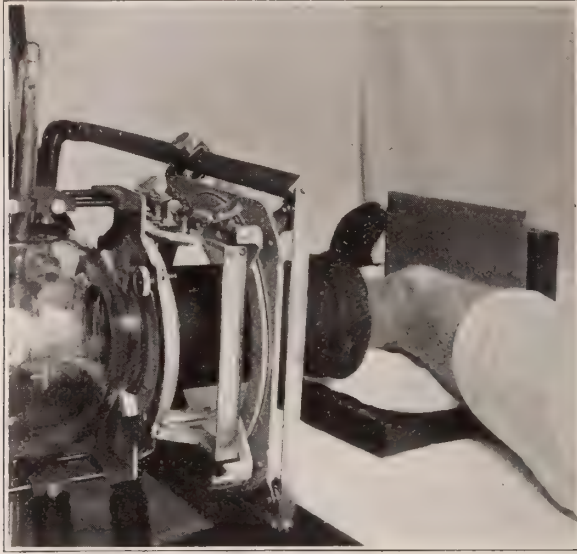


Fig. 5.—Arrangement of tube and part for lateral roentgenogram of knee when the patient cannot be turned as shown in Fig. 3.

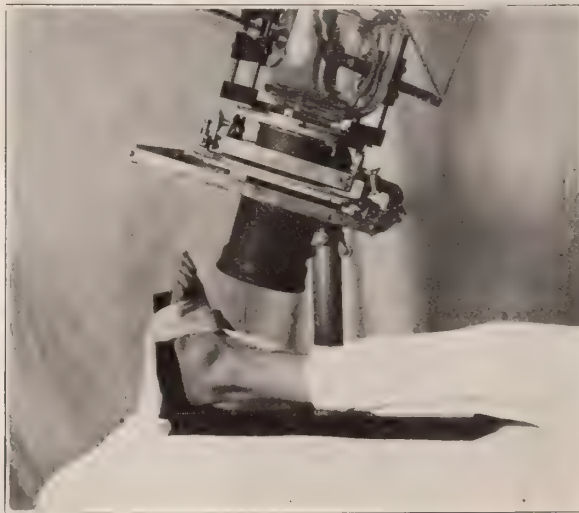


Fig. 6.—Arrangement for anteroposterior study of the ankle-joint.

plate internal, the central ray being focused upon the external malleolus (Fig. 7). If stereoroentgenograms are desired, and they are, of course, preferable, the exposure should be made from a point one and a quarter inches to each side of the external malleolus.



Fig. 7.—Arrangement for lateral study of the ankle-joint.

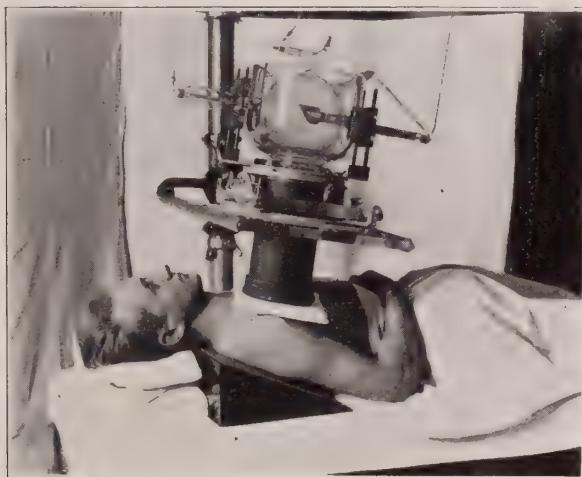


Fig. 8.—Position for roentgenography of shoulder, using pillow under head and wedge under shoulder.

*The Shoulder-Joint.*—Shoulder plates may be made anteriorly or posteriorly. In the average injury, it is usually more convenient to make the plates posteriorly. Because of inability to make exposures in two directions, stereoscopic roentgenograms are always preferable for shoulder work.

The patient should lie upon the back. If a pillow is used, a wedge-shaped block should be placed beneath the shoulder in order to bring the plate as close as possible to the shoulder-joint (Fig. 8). The elbow should touch the table and the hands should be folded upon the abdomen. The central ray should be focused upon the head of the humerus and should approach the plate at right angles.

After injuries, the patient will sometimes be brought into the office with the shoulder and arm bandaged in such a manner as to prevent the position just described, but one must make the best of the situation under the circumstances. The position above described is the ideal one.

*The Elbow.*—The elbow is usually studied in two directions. The writer prefers to make the lateral study stereoscopically. A single plate made with the arm extended, the palmar surface of the hand



Fig. 9.—Arrangement of arm for a ventrodorsal roentgenogram of the elbow-joint.

facing upward, and the olecranon process resting upon the plate, is usually read easily without the necessity of the stereoscopic effect (Fig. 9).

The stereoscopic lateral studies are usually made with the plate against the internal condyle of the humerus (radio-ulnar), the arm being flexed almost to a right angle.

*The Wrist.*—Studies of the wrist should always be carried out by roentgenograms made in two directions. Stereoscopic studies are always desirable in investigating injuries to the carpal bones. The wrist and hand are placed with the palmar surface upon the plate. The central ray is focused over a point midway between the styloid process of the ulna and radius.

Lateral studies of the wrist are also essential. Such studies are a help if one uses a sort of trowel arrangement such as is shown in



Fig. 10. The hand clasps an upright wooden peg in such a way as to hold the wrist perfectly steady during the exposure. The central ray should be focused upon the styloid process of the radius, the plate being placed against the ulnar side of the hand. It is occasionally advisable to reverse this position.

Special positions are recommended for study of certain of the carpal bones. The positions shown in Figs. 11 and 12 are especially useful in these studies.

The writer may be permitted a few remarks on one or two related questions, not directly included in the title of this paper. In this day of intensifying screens, it is extremely important that all plates be marked, whether 'right' or 'left.' This has little prac-

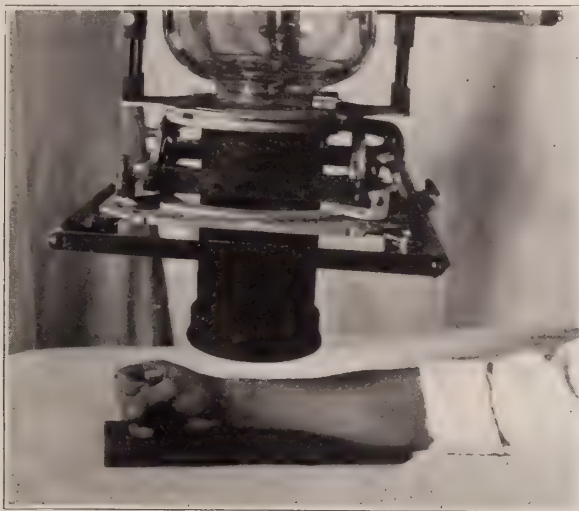


Fig. 10.—Arrangement of forearm for a radio-ulnar roentgenogram of the wrist-joint.

tical value in the actual everyday interpretation of plates, but it is of the highest importance in medico-legal cases when the surgeon may sometimes have to depend upon the roentgenographic record to supply valuable proof. When intensifying screens are employed, the glass side of the plate should always be turned toward the patient, the plate being next to the patient, and the film side of the screen and the film side of the plate being in apposition. This is contrary to the usual procedure, where the film side of the plate is turned toward the patient; therefore, the desirability of marking the plate, whether 'right' or 'left.'

In 1900, the American Surgical Society adopted conclusions upon the medico-legal relations of the Roentgen ray, stating that up to the moment the routine employment of the Roentgen ray in cases of fractures was not of sufficient advantage to justify the teaching

that it should be used in every case. It is high time that surgeons should place themselves on record against such conclusions, and definitely in favor of the routine employment of the Roentgen ray in all fracture cases, and especially as a post-operative examination in such cases, in order to supply themselves with permanent records of post-operative conditions, not only for future protection against medico-legal prosecution, but as a means of self-education. Surely

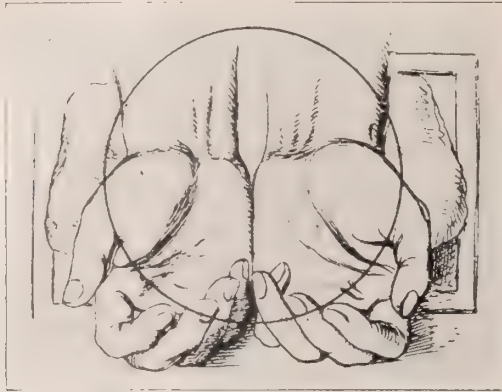


Fig. 11.—Position of the hands suggested by Grashey for a roentgenogram of both pisiform bones.



Fig. 12.—Position of the hands for a radio-ulnar roentgenogram suitable for comparison of both wrists (suggested by Grashey).

no surgeon in this organization is willing at this day to undertake the treatment of a fracture or a joint injury without *x-ray* guidance, if he can by any manner of means invoke the aid of this marvelous agent.

Lastly, the writer wishes to denounce most vigorously the practice, still common, of furnishing prints of roentgenograms to the patient or his friends. It is recognized, of course, that there are circumstances which demand that such a record be transmitted to

another physician when a patient is obliged to change physicians; but it is always possible and highly advisable for the transfer of this kind of evidence to take place directly from physician to physician, not through the medium of the patient. It has been settled over and over again in the law courts that the roentgenograms are the legal property of the man or institution who made them; hence, the patient has no legal right in the plates. What he is entitled to is the evidence which the plates reveal. In the first part of this paper the writer considered at some length the possibility of diagnostic errors dependent upon the disproportion and distortion natural to a shadow-record. These sources of error are multiplied in the hands of the layman. The giving of plates or prints to patients is a pernicious practice, which leads to false conceptions, multiplicity of advice and no end of trouble.

Surgeons can do much to discourage the desire of the layman to secure a copy of his 'photograph,' by a little care in the choice of words when discussing the use of the *x-ray*. A patient referred to the Roentgen department for an '*x-ray picture*' or an '*x-ray photograph*' of a part is, by suggestion, led to expect that when the work is completed he will have a right to a copy of the 'picture'; whereas a patient referred to the Roentgen examining department for an '*x-ray study*' or an '*x-ray examination*' will expect to learn some facts about himself without any thought of picture or photograph.

Finally, the writer wishes to apologize for the elementary style which has been assumed in part of this discussion. He recognizes that he is meeting with men who have had an experience with roentgenology as applied to bones and joints, larger perhaps than any other body of men, except the American Roentgen Ray Society itself. But in order to press home the necessity for a constant technique, and especially for the adoption of the stereoscopic method as a matter of routine, he has thought best to present the question as pointedly as possible, and to beg indulgence for the dogmatic style of the paper.



## ROENTGENOGRAPHY IN PULMONARY TUBERCULOSIS.\*

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By GEO. R. CALLENDER, M. D.,1st Lt., Medical Corps, U. S. Army General Hospital, Fort Bayard, N. M.

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During the past decade roentgenography has become one of the most valuable procedures in the diagnosis of pulmonary tuberculosis, and at the present time it may be considered to rank equally with other methods of physical examination. Physical signs or roentgenography alone may lead to erroneous conclusions, but place both in the hands of experts and the combination leaves little to be desired.

*Technique of Pulmonary Roentgenography.*—The writer does not wish to go into this subject in elaborate detail, but a few suggestions may not be amiss. The exposure should be as short as the apparatus will permit. With the more powerful types of transformers and using an intensifying screen, roentgenograms may be made with one electrical impulse of the alternating current,  $1/120$  of a second. This means that the picture is taken so rapidly that there is no movement of such viscera as the heart, and it is unnecessary for the subject to hold his breath. Personally, the writer does not think that pictures made with the aid of a screen are as satisfactory as those made with a longer exposure without the screen. Exposures of over five seconds, necessary with coils, do not give satisfactory roentgenograms, though taken in this way they are valuable. With a transformer, a tube allowing 40-45 milliampères to pass with a 7-8 inch parallel spark gap will give satisfactory pictures in about two seconds. This time is so short that solid viscera, such as the heart and liver, are clearly outlined. We have been accustomed to assume that when a subject held his breath there was no movement of the diaphragm, but careful examination of plates taken in ten or more seconds will usually reveal double shadows.

To judge roentgenograms, one should endeavor to approximate the same degree of penetration in every case, and to this end vary the time according to the thickness of the subject and differences in the tubes. It is very difficult to make accurate diagnoses with plates of different densities.

The patient should lie with the anterior chest wall next the plate, arms at sides, and the target vertically above the vertebral column at the level of the junction of the middle and lower thirds of the

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*Callender: Roentgenography in Pulmonary Tuberculosis*

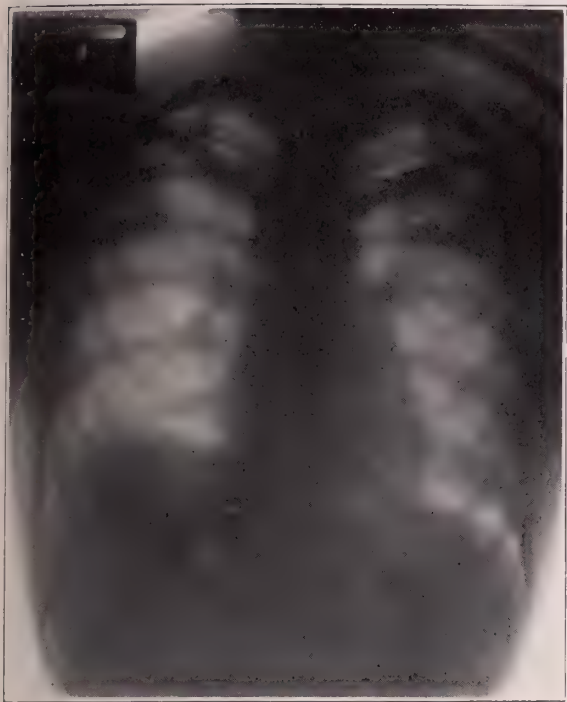


Fig. 1.—Non-phthisical case showing hilus shadows.



Fig. 2.—Inactive case showing large hilus shadows and shadows in the infraclavicular region.

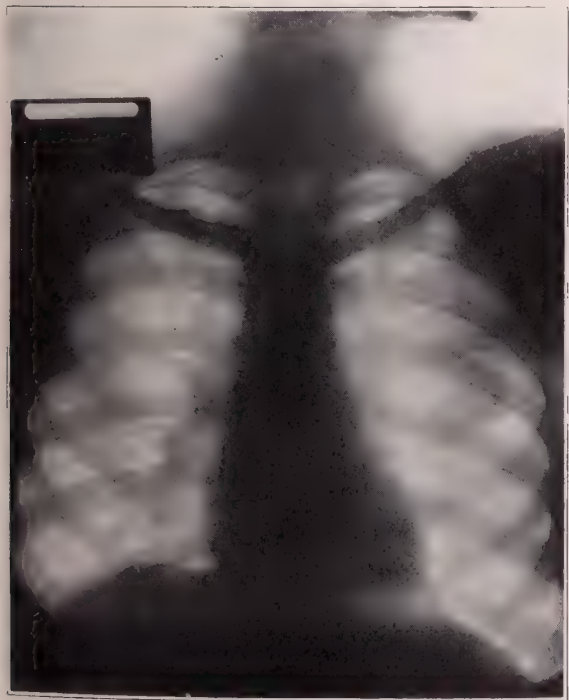


Fig. 3.—Active tuberculosis, as shown by bacilli in the sputum.



Fig. 4.—Calcified hilus glands; no lesions in the parenchyma.

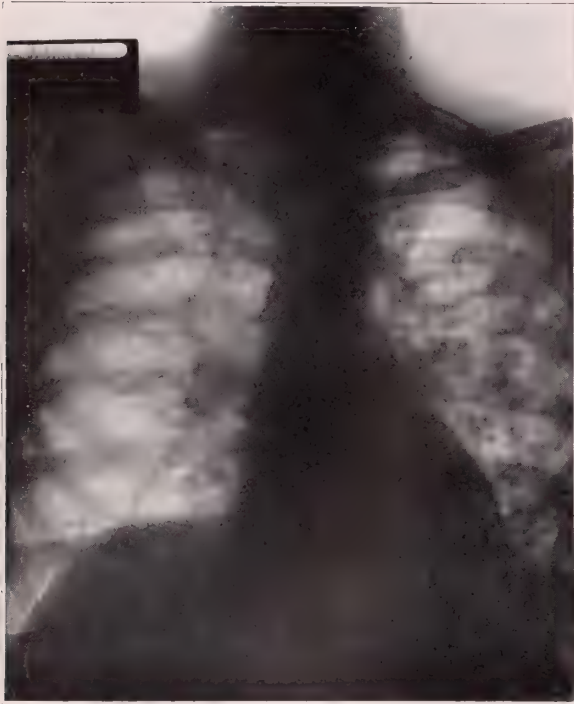


Fig. 5.—Upper lobe involvement with pleurisy over the apex. Calcification of the costal cartilages.

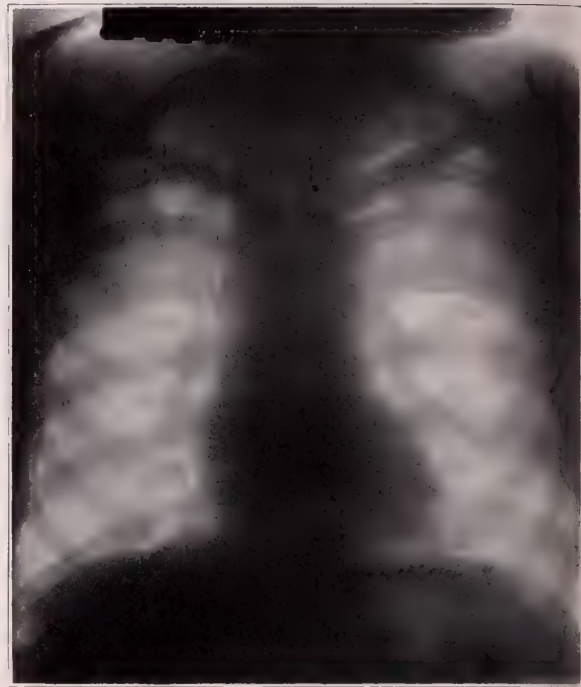


Fig. 6.—Inactive lesion extending from right hilus to lower border of clavicle.



Fig. 7.—Paravertebral tuberculosis, especially marked on the left.



Fig. 8.—Extension paravertebrally on right, into lower lobe on left.



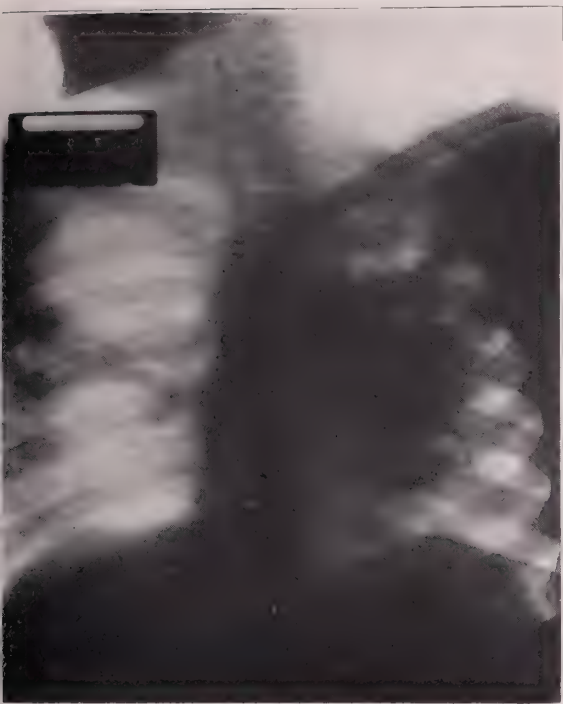


Fig. 9.—Oldest process on left. Hilus extension laterally on both sides.



Fig. 10.—Partially re-expanded pneumothorax on left. Right, early extension into deep lung from hilus at level of sixth rib.

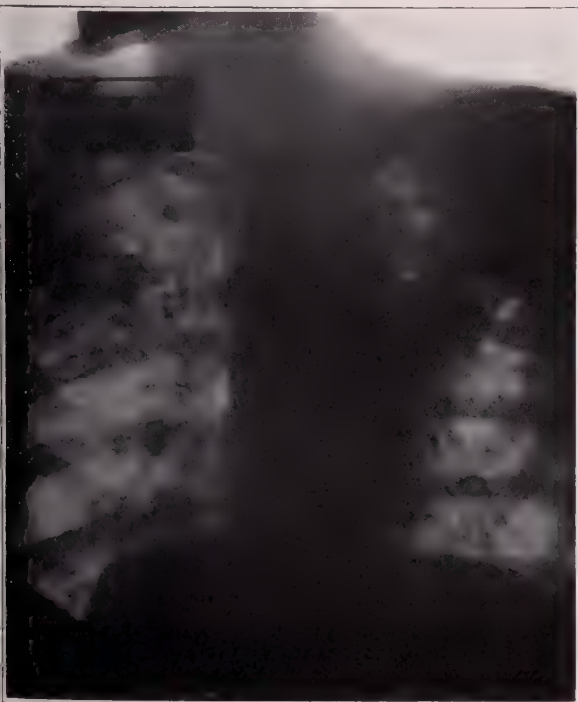


Fig. 11.—Extensive tuberculosis with practically no pleural thickening.

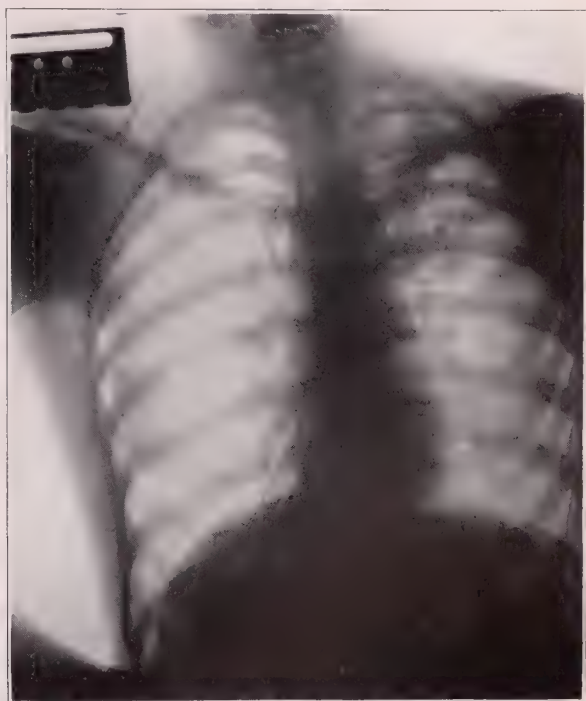


Fig. 12.—Both upper lobes involved with large thin-walled cavities.

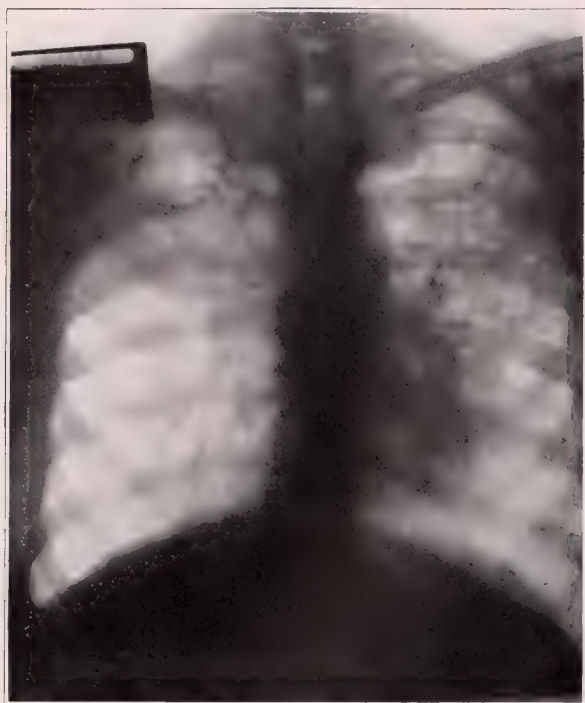


Fig. 13.—Right upper lobe, thick-walled cavity, three thin-walled cavities at the level of the hilus in left lung.

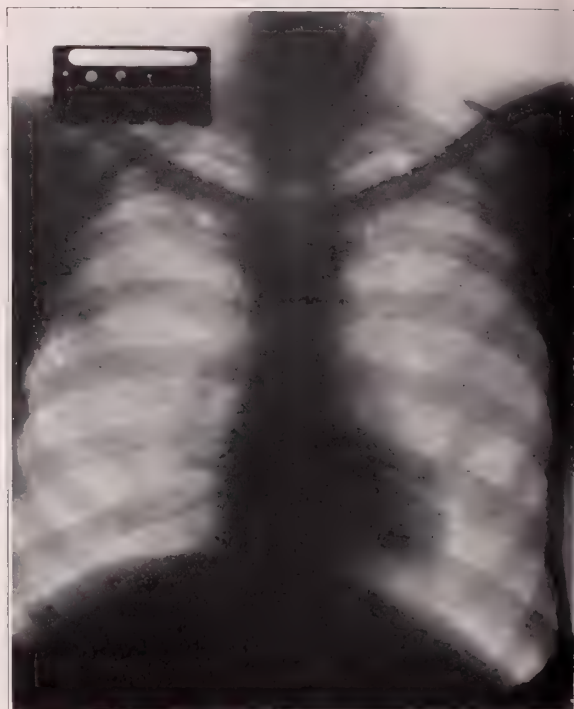


Fig. 14.—Miliary tuberculosis, advanced.

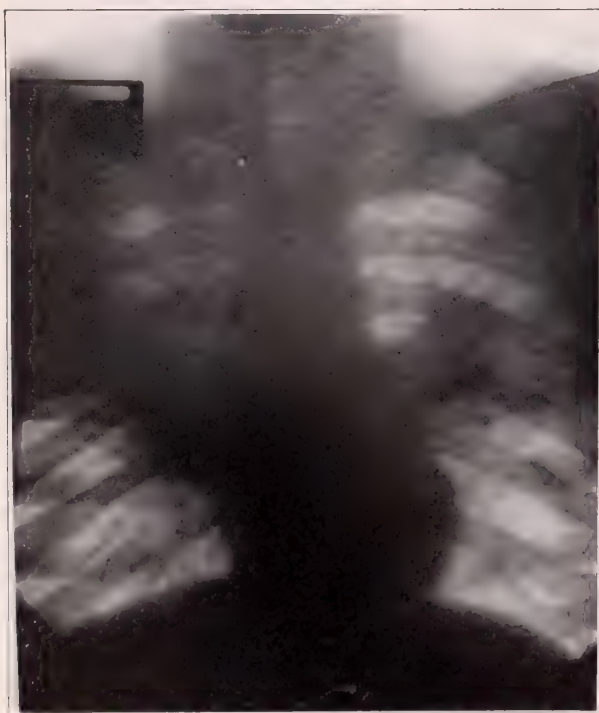


Fig. 15.—Hilus extension laterally on left. Localized bands of adhesions in region of interlobar fissures on right.



Fig. 16.—Left, adhesions drawing the diaphragm upwards.



Fig. 17.—Same case as in Fig. 16. Taken four-  
en months later. Note greater extent and density  
adhesions and higher position of diaphragm.



Fig. 18.—Pneumothorax with subject horizontal.  
Note diffuse clouding.



Fig. 19.—Same case as in Fig. 18. Note clear  
fluid line and floating lung.



Fig. 20.—Pulmonary syphilis and aortic aneurysm.  
Note character of the fleck-like discrete shadows.





Fig. 21.—Large round-celled sarcoma of lung.

scapula. In this position the ray penetrates the scapulæ and gives good pictures of the apices.

Stereoscopic roentgenograms are desirable in all cases, for they allow the location approximately of the lesion and thus are great aids in determining whether a lesion is in the upper or lower lobe at a level where these structures overlap. The shifting of the tube should be across the long axis of the ribs.

The first problem that confronts the phthisiologist is the diagnosis of early tuberculous lesions of the lungs. The view in the past of most phthisiologists has been that the first focus of infection was in the parenchyma of the apical portion of the lung, and the writer regrets to say that this view is still held by a great many. To-day the Roentgen ray and more careful examinations have established beyond reasonable doubt that the primary tuberculous infection is in the tissue of the hilus, *i. e.*, in the lymphatics, while the first parenchymatous focus is usually between the hilus and apex at about the level of the lower border of the clavicle.

You may well ask by what methods and signs this conclusion has been reached. As roentgenograms were taken of cases suspected of tuberculosis and of apparently normal persons, it was observed that practically every case showed more or less marked shadows in the hilus region, with radiating lines extending upwards and downwards in the paravertebral portions of the lungs (Fig. 1). Pictures taken of persons not exposed to tuberculous infection by reason of age or conditions of life, as in the savage races, are not available to any extent. What pictures have been taken of very young children show lines about the hilus rather sharply differentiated and delicate, while those of older persons are thick and are marked by nodular or circumscribed swellings along their course of greater intensity, which, postmortem, correspond to glandular enlargements and fibrosis.

Calmette\* and his associates, using the tuberculin reaction with 'Old Tuberculin,' found that 8.7 per cent. of persons in the first year of life, 22.1 per cent. in the second year, 53.8 per cent. from the second to the fifth years, 81.4 per cent. from the fifth to the fifteenth years, and 87.7 per cent. over fifteen years showed positive reactions. The tuberculin test is at best a rough method of diagnosis and the above results should be judged accordingly.

Alstædt,\*\* using the complement fixation reaction and the partial antigens of Deycke and Much, found that tuberculous infection begins in the first months of life and that hardly a child passes the threshold of the second year without having come in contact with the tuberculosis virus. Numerous other investigations of similar nature might be quoted supporting the investigators mentioned

\**La Presse méd.*, 1911, No. 63.

\*\**Beitr. zur Klin. der Tuberk.*, IV, Suppl. Bd.

above. The above findings, together with those of the roentgenologist, indicate most decidedly that the changes in the hilus are tuberculous in origin.

Additional proof is given to the theory of the tuberculous origin of the hilus changes if we notice that no parenchymal lesion is without its connection by means of thickened shadow lines to the hilus, while sometimes calcified hilus glands are found in the absence of parenchymal lesions (Fig. 4). Not infrequently has the origin of an acute general miliary tuberculosis been found in a liquefied caseous hilus gland, while hemorrhages have been caused from similar conditions in the absence of recognizable parenchymatous foci.

Cases are occasionally encountered which give signs of phthisis in their temperature curves, loss of weight and night sweats and even may show bacilli in the sputum, and yet the most exact methods of physical diagnosis fail to detect any parenchymatous lesions. In these cases the Roentgen ray will show, almost without exception, the evidences of a lesion near the hilus indicated by large nodular shadows and thickening of the lines of Sturtz in the immediate vicinity. One is not justified, however, in reversing this process, as the Roentgen ray will in no way indicate an active process in the absence of clinical manifestations. Active and inactive processes give shadows on the plate impossible to differentiate with any degree of certainty (Figs. 1, 2, 3 and 6).

At autopsy, on advanced tuberculous cases, the hilus glands are always enlarged, and the firmest fibrous tissue is to be found in their vicinity. Calcification, when found, is so frequently in the hilus glands that parenchymatous calcification of any extent is the exception (Fig. 4).

It is true that we cannot be positive of the cause of these glandular swellings, as tumor, actinomycosis, etc., may give rise to similar shadows, but it has been abundantly proved that the shadows are of minimum intensity in glands not the subjects of indurative, calcareous or caseous change. Caseation *per se* casts a well-defined shadow, probably due to its content of sodium chloride and calcium phosphate.

The involvement of the apices requires special consideration because of its prominence in relation to early phthisis. It is remarkable in a large series of roentgenograms of phthical persons how relatively infrequent well-defined shadows in the apex are, except in the advanced lesions and in those accompanied by a thickened pleura. The portion of the upper lobes just below the clavicles is the first involved, while the apex and the summit of the lower lobe follow in sequence. The involvement of the apex usually represents an extension by continuity to a relatively immobile portion of the lung.



Normally, the apices are clear except for continuations of the fine linear markings observed throughout the lung. A diffuse clouding is evidenced by an obliteration of the linear markings. Clinically, this appearance frequently corresponds to auscultatory signs of moisture with or without a change in the percussion, although a thickened pleura may cause it later in the history of the disease (Fig. 5). More frequent than this picture is the appearance of more or less well-defined shadows in the infraclavicular region, while above the linear markings are still discernible (Fig. 2). Small circumscribed shadows indicating healed foci, are occasionally observed in the apices as the only sign of involvement of this portion, even in cases in which the rest of the lung shows advanced disease.

Abundant musculature and fat may cause this portion to appear cloudy and interfere with fine differentiation, and likewise scleroderma, enlarged supra- and infraclavicular glands, etc., interfere with the proper penetration of the ray. If the patient does not have both apices equidistant from the plate there will be a difference in the penetration of the two sides. When the bony thorax is in apposition with the plate, shadows of the bones are clear cut, while separation allows secondary rays from the ribs to render the image blurred.

One must not assume, in the absence of clinical manifestations, that every marked shadow indicates active tuberculosis. Roentgenography indicates past history and the reaction of the organism to the disease rather than present activity, and should be judged only in connection with other methods of diagnosis.

At this point the writer wishes to call attention to methods of extension of hilus lesions. As has already been mentioned, the most frequent extension to the parenchyma, as evidenced by clinical manifestations, is to the upper lobe in the infraclavicular region. Foci here are shown as more or less circumscribed shadows with lines thicker than those seen in the non-phthisical, extending to them from the hilus (Fig. 2). An extension downwards along the vertebral borders of the lungs is rather frequently observed, accompanied in many cases by an adhesive pleurisy over the same region. This represents a lymphatic extension aided by gravity to a relatively immobile portion of the lung. This extension is met with in cases with no other parenchymal involvement, is found at autopsies either as part of the general process or as one of the oldest portions of the lesion, and is one of the most frequent findings in plates taken of phthisical persons. The extension appears in the form of irregularly thickened lines along which are nodular shadows of greater intensity (Figs. 7 and 8).

Fan-shaped extensions, laterally from the hilus, are found either as the primary parenchymal process or more often as the

first involvement of the previously sound lung after the disease has advanced to some extent in the lung primarily affected (Fig. 9). Also after the production of an artificial pneumothorax this is the usual method of involvement of the other lung. The roentgenogram in the latter cases may show by swellings and foci near the hilus in the deep lung, an extension of the process before percussion, and the stethoscope can detect it (Fig. 10). To be sure of the diagnosis in these cases, one should have pictures taken before and immediately after the pneumothorax, so that any change in the roentgenogram can be properly interpreted. Foci in the deep lung, as shown by shadows in the vicinity of the hilus, are not easily diagnosed without the Roentgen ray. When in the plate lines do not extend from a given focus to the periphery of the lung, auscultatory signs are difficult, if not impossible, to elicit, while if the lines do extend to the borders of the lung, as shown on the roentgenogram, definite signs are present by auscultation. This connection between the roentgenogram and auscultation was noted by Colonel G. E. Bushnell, Medical Corps, and as far as the writer has been able to ascertain has never been mentioned in the literature.

In advanced lesions, fibrosis is indicated by dense shadows, the density of which is in proportion to their thickness and which frequently give shadows more dense than bone (Fig. 11). Cavities show as annular shadows of varying intensity with more or less clear centres, depending on the character of the wall and surrounding tissues. The annular shadows of thick-walled cavities are homogeneous in appearance, while those of recent and thin-walled ones are delicate lines made up of fine nodular markings (Figs. 12 and 13). If the lung is very thick and fibrous, or the pleura thickened by an adhesive pleurisy, cavities are somewhat obscured, but in the majority of cases, though one may be in doubt as to whether a given focus is fibrous or caseous, the annular shadows representing cavities offer a diagnosis of this condition approaching certainty.

Acute general miliary tuberculosis gives a very distinct picture when the lesions have advanced enough to interfere with the penetration of the ray. Early in the disease, when the lesions are universal and very small, occurring only in terminal capillaries, death may occur before changes can be demonstrated on the plate, or the patient may be too weak to allow the roentgenogram to be made. Roentgenograms of this condition show the lung covered with delicate fleck-like shadows of minute size and closely approximated.

This appearance is seen in no other condition and is diagnostic (Fig. 14).

A thickened pleura and pleural adhesions cast shadows in proportion to their thickness and density. A generalized adhesive pleuritis gives a diffuse clouding of the whole picture with denser striations, particularly at the locations of the interlobar fissures.

Localized pleural thickenings show as uniform bands and radiating striations (Fig. 15).

The position of the mediastinum and heart may be influenced by adhesions, compensatory hypertrophy of the better or sound lung, exudates and pneumothorax. The roentgenogram alone will clearly indicate the cause of such displacement as well as the exact position of the displacing factor and that of the displaced structures (Figs. 16 and 17).

Roentgenograms taken with the patient in the horizontal position show exudates as a diffuse clouding, but in the vertical position the line of the fluid is shown (Figs. 18 and 19). This fluid line is very sharp if there is air as well as fluid in the cavity, while if no air is present the air-containing lung projects for some distance into the fluid and renders the line more or less indistinct and irregular. Localized collections of fluid, as in encapsulated interlobar pleurisy, are identified by their contour and position in the lung.

Pulmonary syphilis gives us a picture quite distinct from that of phthisis. The shadows, as in the same disease in bone, are clear cut and sharp with no tendency to mossiness of the borders, and the disease can be readily diagnosed by the roentgenogram (Fig. 20). In tumors of the lung, the shadows are homogeneous in appearance and lack the linear markings of the tuberculous lesion. The picture is quite distinct, especially in advanced conditions, and once seen can be easily diagnosed (Fig. 21).

The roentgenoscope shows us the movements of the thorax and the viscera contained in it. The amount of expansion both of the chest-wall and lungs, William's sign, and the movements of the diaphragm are clearly visible.

Aneurysms are shown on the plate, but it is better to view suspected cases with the roentgenoscope for the presence of expansile pulsation (Fig. 20). Fine details cannot be seen on the roentgenoscopic screen.

In conclusion the writer desires to emphasize again that roentgenography shows the reaction of the organism to disease and indicates the past history, but it will not decide the question of activity. A mossiness or irregular blending of the borders of shadows with the surrounding lung is considered to indicate activity, while sharply circumscribed shadows are considered to indicate healing. This conception has good theoretical foundation, as well-healed foci surrounded by a wall of fibrous tissue should give a sharply outlined shadow, while the induration about an active process is necessarily irregular and composed of tissues of different densities. Nature, however, is not constant in her methods of finishing the operation of healing, and we are not justified, as experience has adequately shown, in considering these signs as absolute unless physical examination supports them.



A REPORT OF SIX CASES OF FOREIGN BODIES IN THE  
RESPIRATORY TRACT WITH SEQUELÆ.

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By SAMUEL BERESFORD CHILDS, M. D., of Denver.

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The discovery of the Roentgen ray made comparatively easy the detection of various kinds of foreign bodies in the respiratory tract, but not until the advent of instantaneous roentgenography and stereo-roentgenography has it been possible to determine accurately the secondary changes in the lungs incident to the presence of a foreign body, as well as the definite location of the body in the various bifurcations of the bronchi.

Illustrating this condition the following cases are of interest:—

CASE I.—Mrs. G. B., *æt.* twenty-four, height 5 ft. 6 in., weight 155 lb. Patient had always enjoyed good health until it was found necessary to administer a general anesthetic for the extraction of several teeth. Upon regaining consciousness from this anesthetic, a harassing cough was then noticed which persisted for several weeks, until in July, 1913, she was sent to Colorado for tuberculosis of the lungs. She consulted Dr. Bergtold, of Denver, who, from her history and her physical signs, suspected the possibility of a tooth somewhere in the lower part of the right lung and referred her for an *x*-ray examination. The result of this examination demonstrated the root of a molar tooth with a portion of the crown intact, at the second bifurcation of the lower right bronchus. It further demonstrated a definite area of congestion in the line of the lower radiations distal to the tooth, extending to the diaphragm and the outer angle of the chest. The delusion of tuberculosis was thus dispelled and the patient went to an Eastern city to have the tooth removed. This was successfully accomplished by Dr. Freiberg, of Chicago. The pathological conditions in this case are shown in Fig. 1.

CASE II.—R. H., boy, *æt.* four, referred for *x*-ray examination by Dr. Aubrey Williams, March 17th, 1912. The little patient had inspired a navy bean forty-eight hours prior to the time of my examination. The presence of the bean had occasioned no apparent discomfort for a number of hours, when suddenly he was seized with cyanosis and great distress in breathing. He was removed at once to Denver from a town one hundred miles distant. When brought to my office he was breathing very rapidly and his face indicated marked distress. The roentgenogram (Fig. 2) made at this time disclosed an atelectasis of the outer lower portion of the right lung with marked consolidation of the upper half of the lung. Marked capillary congestion of the left lung was apparent, due, evidently, to the augmented work required of this lung. Diagnosis: Obstruction of the right main bronchus at bifurcation by foreign body. The condition of the child seemed so desperate that no attempt was made to remove the bean. For a few days he ran a high temperature and was very ill, but the alarming symptoms disappeared within a week, at which time air was entering the lower and outer portions of the lung, but the apex was still solid. Another examination was made March 28th, eleven days after the first one; this showed the lower portions of the lung clearing, but there was a circumscribed area of consolidation extending from the apex to

the root of the lung (Fig. 3). As the father was anxious to return home, the little patient left the city. Further improvement in the boy's condition was reported for several weeks; he was able to be up and about, but never felt quite normal. At the end of six weeks, suddenly he became cyanosed with greatly labored breathing and died in a few minutes. No post-mortem was permitted. This case emphasizes the fact that there is always grave danger of death as long as a foreign body, especially a bean or a peanut, remains in a bronchus.

CASE III.—G. S., boy, *æt.* three, inspired a navy bean January 6th, 1913. He was brought to Denver from an adjoining state January 9th and referred by Dr. I. B. Perkins for the location of the foreign body. The boy was well nourished and strong, and was not distressed although his breathing was accelerated and his temperature registered 101° F.

The roentgenogram (Fig. 4) showed nearly complete consolidation of the left lung with distinct capillary congestion of the right. Diagnosis: Obstruction of the left common bronchus at bifurcation. The patient was removed to the Children's Hospital, and through a tracheotomy incision the bean was located by the bronchoscope at point shown by the *x*-ray and removed by Dr. Carmody. One half a navy bean was removed; further exploration with the bronchoscope failed to disclose the other half, and it was inferred that half a bean was the extent of the foreign body inspired. The further course of the case proved this inference to be correct. The boy continued in a most critical condition for about six weeks. Clinically, a pyopneumothorax was considered present by several consultants, but the roentgenograms made January 23rd, February 2nd and March 5th showed a slowly resolving pneumonia. This condition is well illustrated in Figs. 5 and 6.

Permanent improvement in the boy's condition was apparent after the sixth week, and he was able to be taken to his home on March 6th, at which time his temperature was normal, but he looked a decided wreck of his former self. A report from his father, four months later, stated that the child was as well as ever.

CASE IV.—November 23rd, 1906, a young woman, *æt.* twenty, while dressing, placed a 2 in. steel-headed pin in her mouth, which suddenly disappeared down her throat. It was located by Dr. Lockard in the larynx below the vocal bands, but all attempts at removal failed. Later in the day she was removed to the hospital, a general anesthetic administered, and tracheotomy performed by Dr. Powers. The larynx and the trachea were thoroughly explored by the finger, but no pin could be found. A roentgenogram was made on the following morning and the pin located, head downward in the lower left bronchus, behind the heart shadow. Under the deep breathing of the anesthetic the pin had evidently been inspired from the larynx into the bronchus. The patient rallied quickly from the operation, and left the hospital in a few days. Her chest was examined frequently by Dr. Holden, but he was unable to detect any clinical signs over the area where the pin was located, or in any part of the lung. No cough was present, no elevation of temperature, and the patient felt as well as before the inspiration of the pin. Six months later, the patient having had no symptoms in the interim, another roentgenogram was made, and the pin was found in the same position and location as shown by the first *x*-ray examination. The patient shortly left the city and we have been unable to trace her case further.

The fact that a 2 in. pin can be present in a bronchus for six months, without occasioning any symptoms or giving rise to any abnormal sounds upon auscultation is worthy of note.

CASE V.—L. C., girl, *æt.* two and a half, referred by Dr. E. W. Collins. The patient had inspired a small wire nail. A slight cough was the only clinical

sign to suggest the presence of this nail in the respiratory tract. The *x*-ray examination was made within a few hours from the time of the accident. The plates, both anteroposterior and lateral views, showed the nail in the left common bronchus (Figs. 7 and 8). An unsuccessful attempt was made to remove the nail through the bronchoscope. On the following day the child was sent back for a second examination, and the plate disclosed that the nail had disappeared from the bronchus, and was not present in any part of the air-passages. The child had vomited several times, after coming out of the anesthetic, but the nail was not discovered in the vomitus. The only logical inference was that the child, in the act of vomiting, had ejected the nail. This patient died five days later from pneumonia.

The writer recalls another case, referred for location of a foreign body. A young child had inspired some peanut candy. This little patient was desperately ill for a few days, but finally coughed up the foreign material, and thereafter made an uneventful recovery.

CASE VI.—C. F., boy, *æt.* four, referred by Dr. T. E. Carmody. This little boy had inspired a grain of corn, about twenty-four hours prior to the time of the *x*-ray examination. There were no physical signs demonstrable in the lungs, but several attacks of violent coughing accompanied by marked cyanosis had taken place within the past few hours. The *x*-ray examination disclosed no changes present in either lung. From this finding associated with the clinical history, the diagnosis was made of a foreign body in the lower part of the trachea not causing obstruction in either bronchus. The grain of corn was successfully removed by Dr. Carmody from the trachea, at the bifurcation of the bronchi. The child, however, died two days later from pneumonia.

From the above cited cases, the following deductions seem warranted:—

1. A foreign body can be lodged in a bronchus, and give rise to no symptoms to indicate its presence.

2. A foreign body in the respiratory tract may be displaced by the deep breathing incident to anesthesia, so if, at the time of operation, the foreign body is not found at the place where it has been previously located, another *x*-ray examination should show its new position before further exploration is made, or before the operation is abandoned, provided the condition of the patient justifies either of these procedures.

3. A foreign body which does not cast a shadow upon the *x*-ray plate can be accurately located by careful study of the secondary changes in the lung, incident to the presence of the foreign body.

4. A foreign body in a bronchus is a source of great danger to the patient. If the foreign body is of a material that expands with moisture, such as a bean or a peanut, very serious complications are practically sure to result.

5. An *x*-ray examination should be made in every case of suspected foreign body in the respiratory tract, and the foreign body, if present, should be accurately located before any effort is made to remove it. After the foreign body has been located, its removal should be attempted by a skilled bronchoscopist as soon as possible.

Metropolitan Building.



*Childs: Foreign Bodies in the Respiratory Tract*

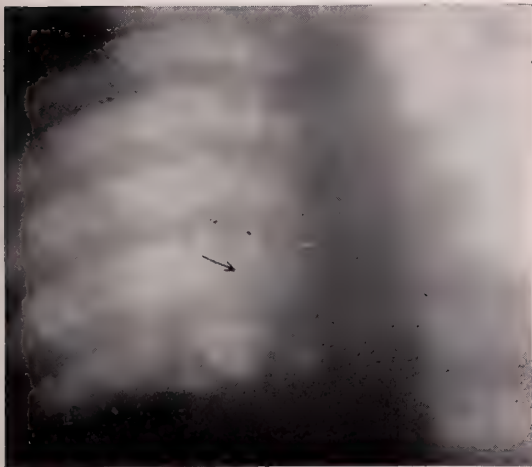


Fig. 1.—The arrow points to the roots of a molar tooth in the lower right bronchus. Note the area of congestion in the right lower lobe, secondary to the presence of the foreign body.

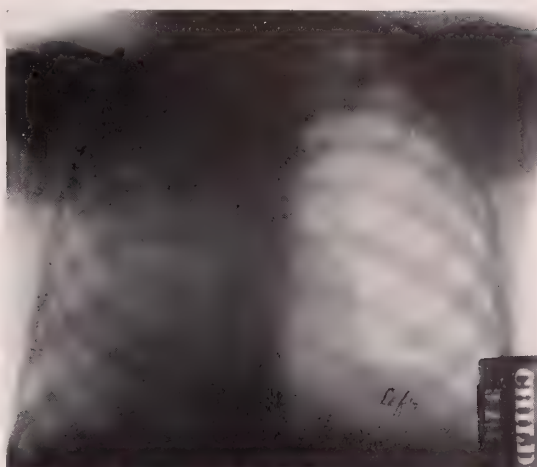


Fig. 2.—Atelectasis of the lower outer portion of the right lung, with marked consolidation of the remainder of this lung, due to the plugging of the right common bronchus by a bean.

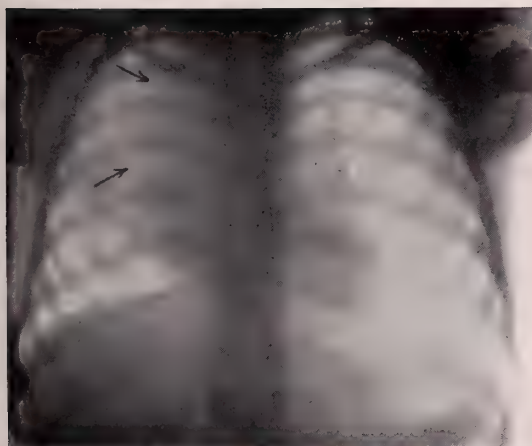


Fig. 3.—Circumscribed area of consolidation extending from the apex to the root of the right lung, as indicated by the arrows. Same case as shown in Fig. 2, but plate made eleven days subsequent to Fig. 2, and thirteen days after inspiration of the bean.



Fig. 4.—Nearly complete consolidation of the left lung, with capillary congestion of the right, due to obstruction of the left common bronchus by a bean.

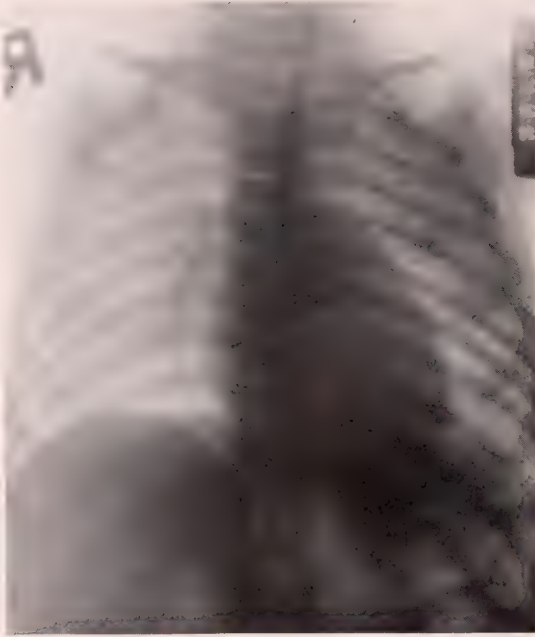


Fig. 5.—Resolving pneumonia of the left lung, after removal of the bean from the left common bronchus. Same case as shown in Fig. 4.

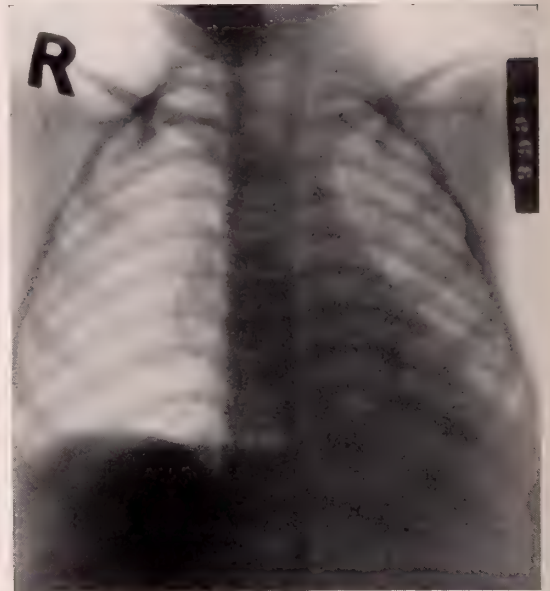


Fig. 6.—Pneumonic process almost entirely disappeared from the left lung. Same case as shown in Figs. 4 and 5.



Fig. 7.—Wire nail in left common bronchus.



Fig. 8.—Lateral view of wire nail in left common bronchus. Same as case shown in Fig. 7.

## EPIPHYSEAL SEPARATION-FRACTURE.

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By DAVID R. BOWEN, M. D., of Philadelphia,

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Jefferson Hospital.

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During the past three years I have been impressed with the frequency with which epiphyseal separation was accompanied by fracture of a greater or less fragment from the diaphysis; and have, in this period, collected 38 cases in the Roentgen service of the Pennsylvania Hospital. Of these, 21 were of the distal end of the radius: 1 at 7 years; 2 at 9; 6 at 10; 1 at 11; 3 at 13; 3 at 14; 3 at 15; 1 at 16; 1 at 18.

Four cases were of the head of the radius: 3 at 12; 1 at 13.

Four cases of the metacarpal: 2 at 10; 1 at 13; 1 at 14.

Two cases of the distal end of the humerus: 1 at 5; 1 at 12.

Two cases of the distal end of the femur: 1 at 14; 1 at 22.

One case of the fibula, about 15 years.

Four cases of the base of the tibia: 2 at 8; 2 at 16.

During the same period I have seen no case of positive Roentgen diagnosis of epiphyseal separation without this fracture. For this reason, I propose the term epiphyseal separation-fracture as one fitted to describe this condition, and to emphasize its frequency.

The subject matter is not new. Poland, in 1898, published a monograph, "Traumatic Separation of the Epiphyses," which is astonishing in its completeness. Indeed, there is something of irony in the appearance that the very completeness of this admirable work has prevented its popularity; and to-day it is comparatively unread, so much so that I feel justified in adding a contribution. Experience leads me to the belief that, clinically, actual diagnosis of separation of an epiphysis, as distinguished from a fracture, is practically unusual. Given a fracture close to an epiphysis, one may, with the patient's age known, make a shrewd guess. My impression is, however, that most of these cases were diagnosed as fracture; and that most of the cases referred for Roentgen examination, with the diagnosis of epiphyseal separation, have proved to be fractures. I am led to believe, also, that, except in the very young, epiphyseal separation without fracture is very unusual. This is corroborated by Poland, who also quotes from Malgaigne, Richet, Ricard and Bruns, to the same effect. Unfortunately, the Roentgen diagnosis of epiphyseal conditions under the fifth year ranges from difficult to impossible. This will tend to decrease ma-





Fig. 1.

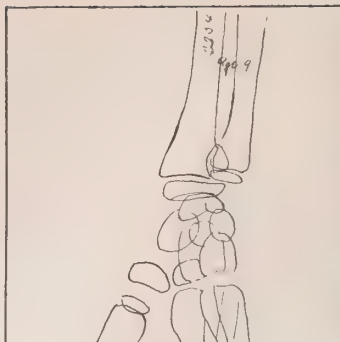


Fig. 2.

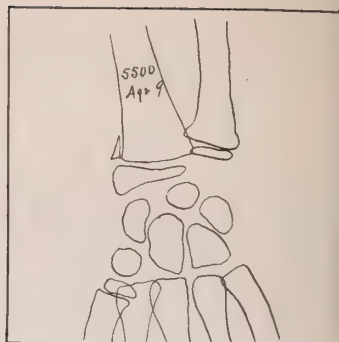


Fig. 3.

Fig. 1.—Epiphyseal separation-fracture of the base of the radius. Greenstick fracture of the ulna.

Fig. 2.—Epiphyseal separation-fracture of the base of the radius, ulna side.

Fig. 3.—Epiphyseal separation-fracture of the base of the radius.



Fig. 4.

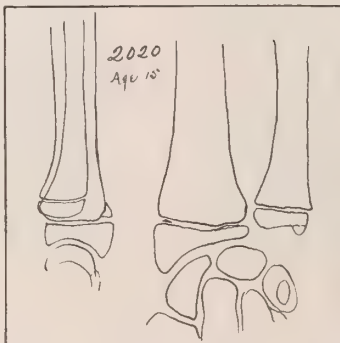


Fig. 5.

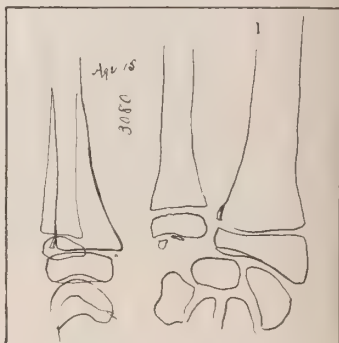


Fig. 6.

Fig. 4.—Epiphyseal separation-fracture of the base of the radius, extero-dorsal aspect. Fracture, without epiphyseal separation, of the styloid of the ulnar epiphysis.

Fig. 5.—Epiphyseal separation-fracture of the base of the radius, dorsal aspect. Fracture, without epiphyseal separation, of the styloid of the ulnar epiphysis.

Fig. 6.—Epiphyseal separation-fracture, both palmar and dorsal aspects, of the base of the radius. Fracture, two fragments without epiphyseal separation, of the styloid of the ulnar epiphysis.

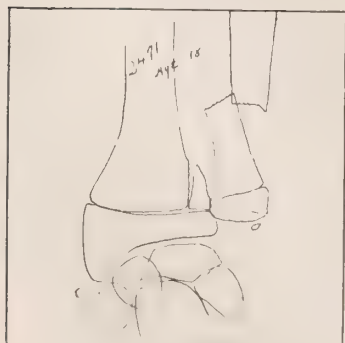


Fig. 7.



Fig. 8.

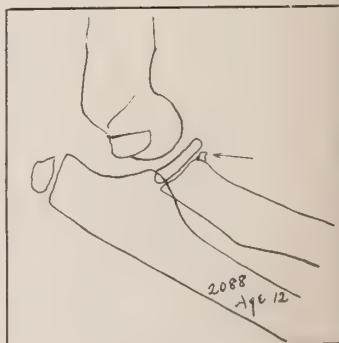


Fig. 9.

Fig. 7.—Epiphyseal separation-fracture, ulnar aspect, of the base of the radius. Fracture of ulna and ulnar styloid without separation of ulnar epiphysis.

Fig. 8.—Epiphyseal separation-fracture of the base of the thumb metacarpal.

Fig. 9.—Epiphyseal separation-fracture of the head of the radius. No other bone injury.

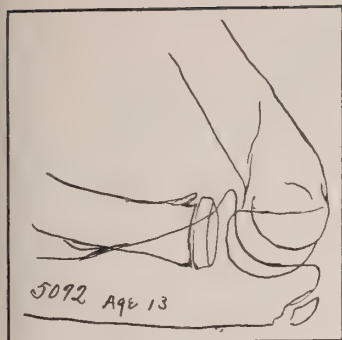


Fig. 10.

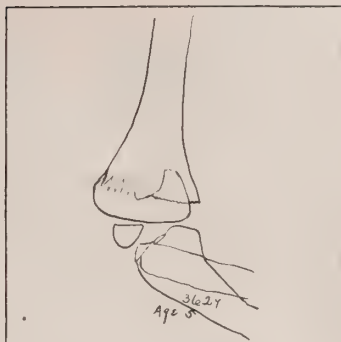


Fig. 11.

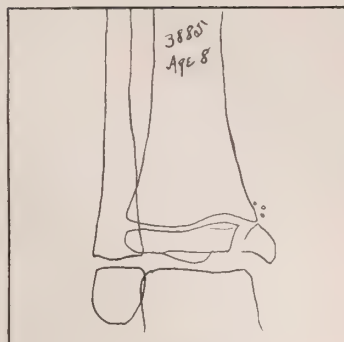


Fig. 12.

Fig. 10.—Epiphyseal separation-fracture of the head of the radius without other bone injury.

Fig. 11.—Epiphyseal separation-fracture of the distal end of the humerus. Rotation of the epiphysis. Greenstick appearance of fracture.

Fig. 12.—Epiphyseal separation-fracture of the internal malleolus without separation of the entire epiphysis.

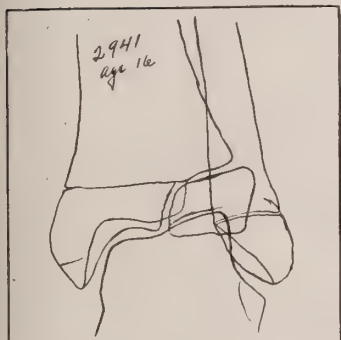


Fig. 13.

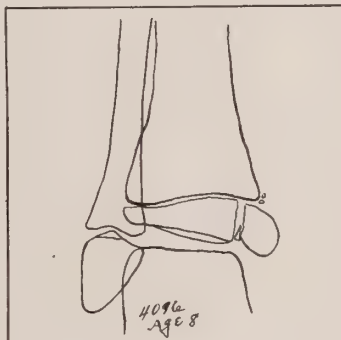


Fig. 14.

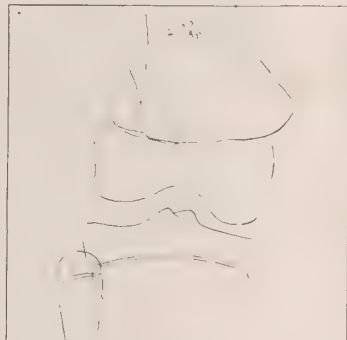


Fig. 15.

Fig. 13.—Epiphyseal separation of the base of the tibia, fibular aspect, without separation of the entire epiphysis.

Fig. 14.—Epiphyseal separation-fracture of the internal malleolus. An interposed fragment but no separation of entire epiphysis.

Fig. 15.—Epiphyseal separation-fracture of the distal end of the femur.

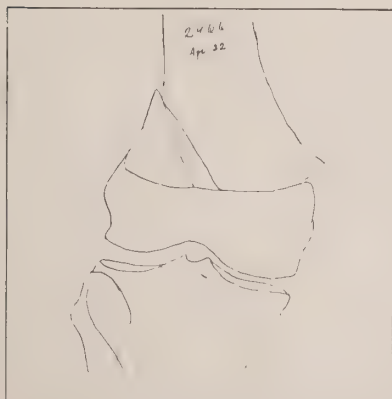


Fig. 16.

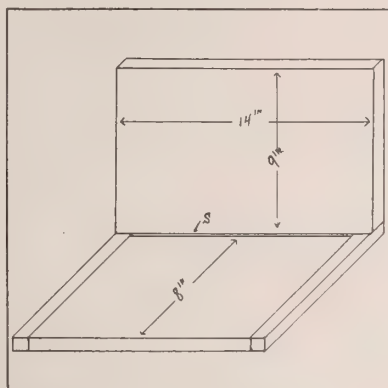


Fig. 17.

Fig. 16.—Epiphyseal separation-fracture of the distal end of the femur.

Fig. 17.—Frame used to secure two position views of wrist without discomfort or injury to patient. (S) slot into which envelope fits for second exposure.

terially the number of simple separations in purely Roentgen statistics.

*Technique.*—Expose and develop for soft detail. Stereoscopic exposures are frequently desirable. Some years ago Dr. Caldwell showed me some wrist plates made with three exposures on one 8x10 plate, the middle exposure being made with the tube vertically over the subject, while each of the others was made with the tube moved  $6\frac{1}{2}$  cm. to either side of the centre. This gives three views, each  $3\frac{1}{3}$  in. in width, which may be examined as two stereoscopic pairs, using the ordinary parlor stereoscope. However, no stereoscopic examination in one position can take the place of exposures made in two planes (at angles to each other of  $90^\circ$ ), and these should always be made whether or not the stereoscopic method is used.

In these cases, as in fractures, rotation of the wrist to secure the radio-ulnar position is bad practice. In addition to causing discomfort to the patient, the danger of displacement is considerable. To obviate this, I use a device, a diagram of which is shown in Fig. 17. With this the dorsopalmar exposure is made with the plate resting on the base of the frame, while the radio-ulnar exposure is made with the plate supported in the slot and against the upright. The tube is, of course, tilted  $90^\circ$ .



INDICATIONS AND CONTRAINDICATIONS TO THE X-RAY  
TREATMENT OF UTERINE FIBROIDS.\*

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By SAMUEL STERN, M. D., of New York,Radiotherapist to Mt. Sinai Hospital and Chief of the Radiotherapy Department, Mt. Sinai Hospital Dispensary.

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The *x*-ray treatment of uterine fibroids, while still comparatively new, has nevertheless stood the test of sufficient time to enable us to begin drawing conclusions as to the results accomplished, and the proper class of cases best adapted to this treatment.

The results achieved have been most gratifying. I have no hesitation in saying that in properly chosen cases, treated with the proper technique, we can get practically 100 per cent. cures.

This has been the experience reported by most of the gynecological clinics abroad, and I feel that my results fully justify drawing the same conclusions.

In fact, I do not know of a single ailment amenable to Roentgen therapy where we can look forward to a satisfactory termination with the degree of certainty, as in a case of properly chosen uterine fibroid.

As to the cases best adapted to this treatment, I take for granted that we all concede, that where the same result can be accomplished by a conservative treatment as by means of an operation, the procedure which does not include the operative risk is always to be preferred.

This operative risk is not a negligible quantity. Even in the most competent and careful hands it is worthy of consideration.

Other important factors to be considered are the severe psychical and physical manifestations that generally follow a complete hysterectomy, and usually persist for years.

While Roentgen therapy does not enable us to avoid these manifestations completely, it does help us to modify their severity to a considerable degree.

The change of conditions produced is much more gradual and it gives the system considerably more time to become accustomed to them.

The dangers connected with the *x*-ray treatment of uterine fibroids as administered to-day, with proper technique, are practically *nil*. By carefully measuring our dosage, using rays of proper penetration, filtered through aluminum and other filters, the danger

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\*Read at a meeting of the Eastern Medical Society, April 9th, 1915.

of producing a severe x-ray dermatitis has been practically eliminated.

As the years roll on and as we carefully follow the thousands of cases treated by this method, the fear of possibly producing some permanent injury to the other abdominal organs is also gradually disappearing. If the case has been treated to its proper termination, that is to the production of a permanent amenorrhea, the danger of possible recurrences can also be disregarded.

Krönig and Gauss, of Freiburg, to whom we are indebted for developing the most satisfactory technique for the treatment of these cases, and who probably have the largest number treated to their credit, consider all uterine fibroids amenable to Roentgen-ray treatment, with the following exceptions:—

1. Pedunculated fibroids partly showing through the cervix.
2. Cases in which gangrenous degeneration of fibroid is suspected.
3. Fibroids accompanied by carcinoma, or those that have undergone sarcomatous degeneration.
4. Fibroids which led to acute incarceration of the bladder.

They make no allowance for the size of the fibroid, nor the age of the patient.

I thoroughly agree with them as far as the size of the fibroid is concerned. The majority of the patients I treated had large fibroids, reaching up to the umbilicus.

But as regards the age of the patient, I must say that I found it extremely difficult to produce a complete and permanent amenorrhea in very young women.

In one case of a woman aged thirty-two, I was compelled to give 9 complete series (with strict adherence to the Freiburg technique) with some intravaginal raying, until I finally succeeded in producing an amenorrhea, which although lasting for some months now, I am not at all convinced will prove permanent. The fibroid which originally reached up to the umbilicus, is hardly palpable at present, and the last few menstruations she had preceding the amenorrhea were practically normal. Perhaps we are wrong in trying to produce a permanent amenorrhea in these cases. I think temporary amenorrhea with a diminution of the fibroid and normal reestablishment of menstruation is much more ideal, and I believe this can often be accomplished.

I have a number of these cases, one as young as seventeen years, where I succeeded in getting an amenorrhea lasting up to ten months, followed by a reestablishment of normal menstruation.

Of course, it is rather difficult always to accomplish this with certainty. There is too much of the individual element involved, so that it is always possible that the amenorrhea will become perma-

nent, or that on the reestablishment of menstruation, the profuse bleeding may start at any time.

For this reason, unless an operation is objected to, or contra-indicated, in women under forty years, in cases in which a partial operation can be performed, leaving sufficient behind to permit them to continue with their menstruation, it is perhaps preferable to operate. But in cases where a complete hysterectomy must be done, *x-ray* therapy should unquestionably have the preference.

The most interesting case I have had so far is a young woman of thirty-two who, after 34 *x-ray* treatments (fractional method), given over a period of six months, became pregnant, was delivered of a perfectly normal child, normal labor, and has kept well up to date, a period of three years.

The cases best adapted to Roentgen therapy are those nearing menopause. There is no question that the older the patients are, the nearer the climacteric period, the surer and quicker are they influenced by *x-ray* therapy.

Another contra-indication that may be mentioned are the fibroids accompanied by large ovarian cysts.

The *x-ray* will not diminish the size of these cysts; so as long as they have to undergo an operative risk, there is no reason why they should have to bear the additional burden of *x-ray* therapy. At one time Albers-Schönberg advised against *x-ray* therapy in very profusely bleeding and anemic women, on the grounds that *x-ray* therapy may temporarily increase the loss of blood. With the Freiburg technique this does not hold good.

I think it is just these anemic women who make poor operative risks, and who should by all means be given the benefit of *x-ray* therapy. Some of the patients I have treated bled for months continuously, with a hemoglobin below 35 per cent. when treatment was begun. They all did well.

As regards the question of submucous fibroids, at one time this was considered a contra-indication to Roentgen therapy, but with the improved technique they probably yield as readily as the others. A fair percentage of the cases I treated with satisfactory results was unquestionably submucous fibroids.

The scope of this paper does not permit me to go into any detail as regards the technique of the treatment. I will merely say that there are only two methods worthy of consideration. One is the Albers-Schönberg, or fractional technique, and the other is the Krøenig and Gauss (massive dosage) method.

Of these, the latter is far preferable, as giving quicker, surer and more satisfactory results. I used the Albers-Schönberg technique for about two years, and found that the best I could accomplish was about 65 per cent. cures. With the Krøenig and Gauss tech-



nique, which I have been using for the past year and a half, I succeeded in getting satisfactory results in every case treated.

In conclusion, I wish to emphasize again that—

1. The dangers of *x*-ray therapy in the treatment of uterine fibroids, with proper technique, are absolutely none.

2. All uncomplicated cases of uterine fibroids are amenable to *x*-ray treatment, especially in women above forty years.

3. The nearer they are to the climacteric period, the surer and quicker the results.

4. In these cases, properly treated, we can look forward to getting practically 100 per cent. cures.

41 West Fifty-first Street.

ACCIDENTAL ROENTGEN DIAGNOSIS OF  
CHOLELITHIASIS.

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By DAVID M. BERKMAN, M. D.,  
Mayo Clinic, Rochester, Minn.

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The experience of our clinic has been that in the diagnosis of gall-stones by the Roentgen ray a negative finding is worthless, while a positive finding is most conclusive evidence. A striking illustration is offered by the following case in which the diagnosis



Fig. 1.—Pendulous gall-bladder full of stones hanging down toward the right pelvis.

was accidentally made during the course of routine Roentgen examination of the dorsal and lumbar vertebræ.

CASE 123,430.—Man, *æt.* thirty-seven, physician, married. Examined January 27th, 1915. Previous history, negative. Clinical history. Fifteen years ago the patient had an attack of very severe

cramping pain in the epigastrium lasting half an hour. Since then he has occasionally had slight distress in the right side to which he attached no significance. His present trouble began five years ago with an attack of lumbago, and since then he has had backache almost continuously, located at the lumbosacral juncture with a few tender areas higher up. This condition has kept him very nervous. He is under weight and incapable of doing as much work as formerly; has been forced to give up part of his practice. Bowels regular, appetite good. Physical examination, negative. Roentgen findings: Pendulous gall-bladder, full of stones, hanging down toward the right pelvis. (See illustration.) Spine negative. Operation: Cholecystectomy and appendectomy. Gall-bladder was found filled with stones. The appendix showed well-marked evidence of disease.

Since the operation, one month ago, the patient has been absolutely free from backache for the first time since the trouble began. His general condition has improved proportionately.



## A DEVICE TO FACILITATE RADIOGRAPHY OF THE STOMACH.

By G. C. JOHNSTON, M. D., and G. W. GRIER, M. D., of Pittsburgh.

We have been using in our laboratory for the past two years a device for improving the technique of stomach radiography, which has proved so generally satisfactory that we take this opportunity of presenting the same to public attention. The defects in contour



Fig. 1.

of the stomach caused by pressure when the patient lies prone upon a hard plane surface are well known. Distortion of the pyloric end of the stomach, obliteration or distortion of the cap, displacement of the stomach so that it overlies the cap or prevents it from filling, are other troubles which arise from the same cause.

To overcome these difficulties we constructed a table, the top of which is made from a canvas army stretcher. A hole a foot square is cut in the canvas top about its middle, so that when the patient lies prone upon the table, the abdomen protrudes through the hole.

The canvas adapts itself to the contour of the body so that undue pressure is not made against the abdomen at the edges of the hole. A shelf below the hole, and adjustable in height to account for the varying distances that different abdomens protrude through the hole, carries the plate or intensifying screen.

The first table we built has only one pair of legs, the other end being hinged against the wall. With this table any degree of Trendelenberg posture is obtainable by merely raising and blocking the outer end of the table. When not in use the table can be folded up against the wall. This table is illustrated in Fig. 1.

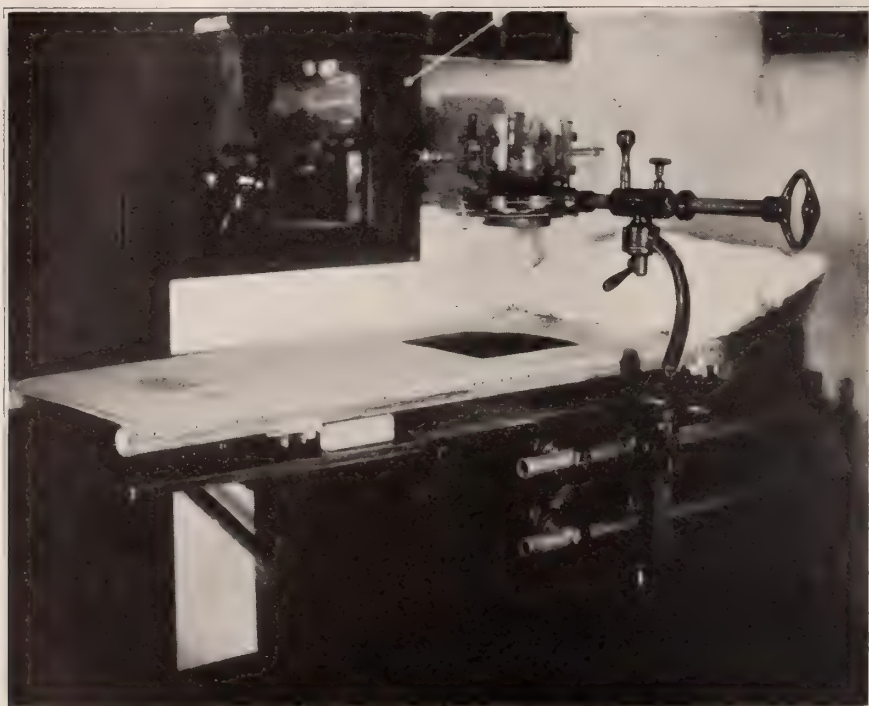


Fig. 2.

Feeling very keenly the necessity for this device on our fluoroscopic radiographic table, which is a home-made model of Pirie's modification of the Cole table, we added one of these stretchers to this table (Fig. 2). In this instance we have merely laid the stretcher over the ordinary table-top. Blocks are fastened on the under surface of the stretcher frame to raise the canvas top 5 in. above the table-top, which we have found to be a good minimum working distance between the two tops. Extra blocks are added when a greater distance is desired. Numerous mechanical devices for obtaining a variable distance between the two tops will sug-

gest themselves to the reader. The method we employ is without doubt the crudest possible, but has the advantage of being very simple and the saving virtue that 'it works.' The stretcher is perfectly movable upon the table-top proper, and can be moved around with the patient on it and so adjust the desired part over the aperture in the lead lining of the table-top. It can also be taken entirely off, folded up and stood in a corner and the table used as an ordinary radiographic table if so desired.

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### THE MEASUREMENT OF THE BIOLOGICAL ACTION OF X-RAYS AND GAMMA RAYS.

Various methods have been employed for measuring the action of  $x$ -rays and gamma rays of radium, some of them depending on photographic and chemical, others on electrical and phosphorescent effects. Dr. B. Szilard,\* however, urges that ionization is the only satisfactory method of measuring the biological action of such rays, although up to the present time it has not been given its proper place in dosage. While there is great physical analogy between the various radiations, it is by no means certain that their biological properties are the same. The fact that dermatitis caused by  $x$ -rays has been cured by radium suggests that there are differences in the biological effects of the two forms of radiation. Indeed, such differences might be expected from the fact that gamma rays are perhaps thirty times more penetrating than the hardest  $x$ -rays; this quantitative physical difference may readily be translated into a qualitative biological one. The methods of measurement at present in use do not give satisfactory information as to the biological properties of the rays; ionization measures at one and the same time both the quality and quantity of the radiant energy. It has the advantages that  $x$ -rays are measured after they have left the tube, that it is unaffected by physical factors other than the radiation itself, and that the radiation may be measured in absolute electrical units. The principle of the method is to measure numerically the number of ions liberated under the effect of the radiation, the measurements being carried out by the successive charge and discharge of an electric condenser of known capacity. The theoretical unit of quantity which the author proposes is the amount of radio-active energy necessary to set free a single ion in air under normal conditions of temperature and pressure. Individual ions, he points out, have an actual existence, determining, as they do, the chemical reactions of a gas, and probably also its biological phenomena, so that the number of ions may really be taken as a measure of the biological effect. For practical purposes, of course, seeing that the energy necessary to set free a single ion is infinitesimal, some multiple of this unit is required, and accordingly he sets up the mega-mega-ion, being the amount of radiation which will set free a million million ions in air; while as corresponding unit of quality he employs the absolute coefficient of absorption of the rays also in air.

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\**Archives d'électricité médicale*, No. 385, 1914; (Abs. *British Med. Jour.*, 1915, No. 2825, p. 346, February 20th).



# SIMPLE ROENTGEN ACCESSORIES.

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## FLEXED KNEE SUPPORT.

This is an old Roentgen accessory which finds its usefulness in genito-urinary examination and exposures of the spine. It is used to reduce the normal anterior curve of the lumbar spine so as to approximate the patient's back to the plane of the Roentgen negative.

This knee support is simply two boards about 12 by 14 in., securely fastened together at an angle of  $45^{\circ}$  with the open angle closed by a brace board. It looks like the capital letter A.

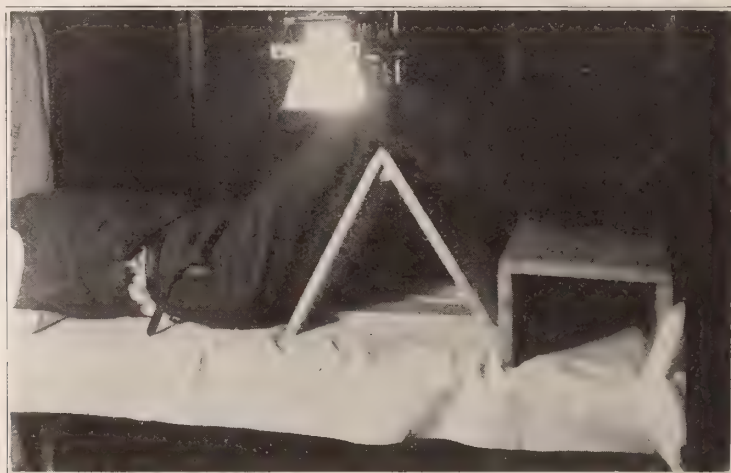


Fig. 1.

The accompanying illustration (Fig. 1) shows the additional use of the knee tunnel under the feet where the patient's legs are short. This knee tunnel was described and illustrated in the preceding issue.

The knee support is especially valuable in renal and spinal exposures, not only for approximating the parts to the plate, but also to steady the patient, relax the abdomen and permit more satisfactory compression.

This knee support has been made in several ways; many have attachments to hold the knees together; but the principle is just the same—namely, to straighten out the lumbar lordosis and relax the abdominal wall.

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## AN ANTEROPOSTERIOR FOOT POSITION.

The accompanying illustration (Fig. 2) shows the combination of the knee support just described and the well-known wooden

wedge to procure an easy, comfortable position of the foot for an anteroposterior exposure.

The knee is flexed over the knee support and the wedge placed under the extended foot with the plate upon the incline of the

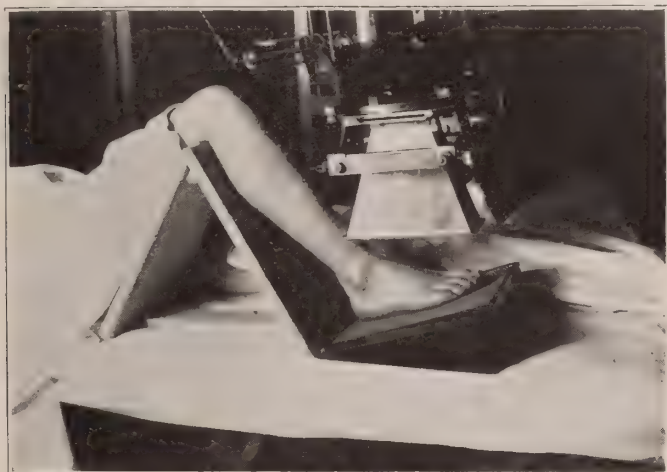


Fig. 2.

wedge beneath the foot. The tube is centered above the base of the metatarsals in the median line with the parallel ray at more of a perpendicular to the table than to the inclined plate. (See illustration.)

#### COTTON COMPRESSION PADS.

Every laboratory will find an increasing use of these soft pads. They can be made of a double thickness of absorbent cotton about 12 in. square, covered with cheese cloth or gauze and tacked in several places to avoid the bunching of the cotton. They are available in so many situations that one can scarcely enumerate them all. To generalize they may be used as follows:—

1. After the tube has been focused, one or two pads are placed between the part and the metal compression cylinder, thus avoiding the contact of cold metal and skin.

2. A thin pad may be placed between metal cassetts and skin to avoid chilling and discomfort.

3. They may be used underneath the sacrum and other parts in promoting ease and comfort to the patient.

4. In deep treatment work they may be used between the tube and patient to cut off static breezes.

5. They may be placed between the head and plate to promote comfort and to establish the correct position of the head.

If these pads are made of clean, absorbent cotton and tacked with fine thread with small knots there is no photographic shadow of them visible upon the plate.

#### FLUOROSCOPIC TRACING GLASS.

During fluoroscopic examinations one frequently wants to trace outlines of the stomach or colon, upon the lead glass covering the

fluorescent screen, with fatty colored pencils. Such tracings may then be transferred or retraced upon thin transparent paper for filing with the case record.

To save time and avoid the confusion incident to rapidly succeeding examinations, it is convenient to arrange the fluoroscopic screen with a plain glass on top of the lead glass so that the paper copies may be made at a more convenient time by an assistant.

The accompanying illustration (Fig. 3) shows how the frame may be chiseled out to permit the attachment of screw swivels for



Fig. 3.

holding the glass in place. One can then keep several clean glass plates (old x-ray plates, cleaned) convenient for rapid exchange if necessary. Obviously, each tracing glass should show the name, date and time of the tracing to avoid confusion later.

#### FOOT SWITCH.

There are several situations with even the smallest Roentgen installations where a foot switch is extremely desirable. It becomes almost a necessity where one is doing any fluoroscopic work, because, if one has the time of exposure constantly under the con-



Fig. 4.—Foot Switch.



trol of the foot, the tube will not be allowed to run any longer than is necessary. The foot switch can be attached by a long cable in the primary circuit. The accompanying illustration (Fig. 4) is of a type of foot switch which is supplied by nearly all the Roentgen manufacturers at a very low price.

#### REPEATING SERIAL TIMER.

The accompanying illustration (Fig. 5) is of a repeating timer which has been upon the market for a number of years. It is claimed by this device that there are very few mechanical moving parts and that an indefinite duplication of serial exposures can be made by simply pulling the string. The indicator may be set so that the exposures may be anywhere from  $\frac{1}{60}$  of a second to 10

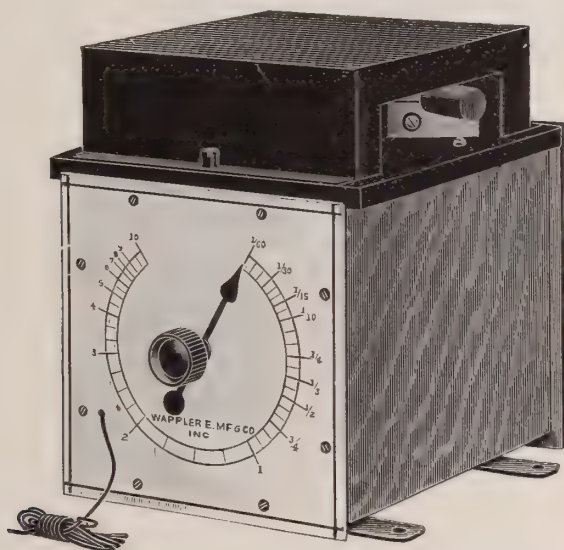


Fig. 5.—Repeating Serial Timer.

seconds. The construction of this timer consists of an actuating mechanism, which permits a pair of contacts to close an electric circuit through a magnet and remain closed for a predetermined length of time, this being accomplished by the magnet pulling a pair of large contact surfaces together, closing the circuit through the transformer. At the expiration of the predetermined length of time, the first circuit breaks, the magnetism collapses, and the large contacts are instantly separated by strong spiral strings. It is useful for circuits up to 40 ampères.

#### IMPULSE TIMER.

Dr. E. W. Caldwell conceived the idea of employing the alternations of the electric current to actuate the remote control switch for the purpose of shutting off the current from transformers momentarily for a predetermined time, according to the number of A. C. impulses allowed to pass from the start to the finish of an x-ray

exposure. An electro magnet, traversed by the alternating current, actuates an armature; the reciprocating motion of this armature is translated into a rotary motion by a ratchet, each stroke moving the wheel ahead one cog, so that each alternation is one subdivision

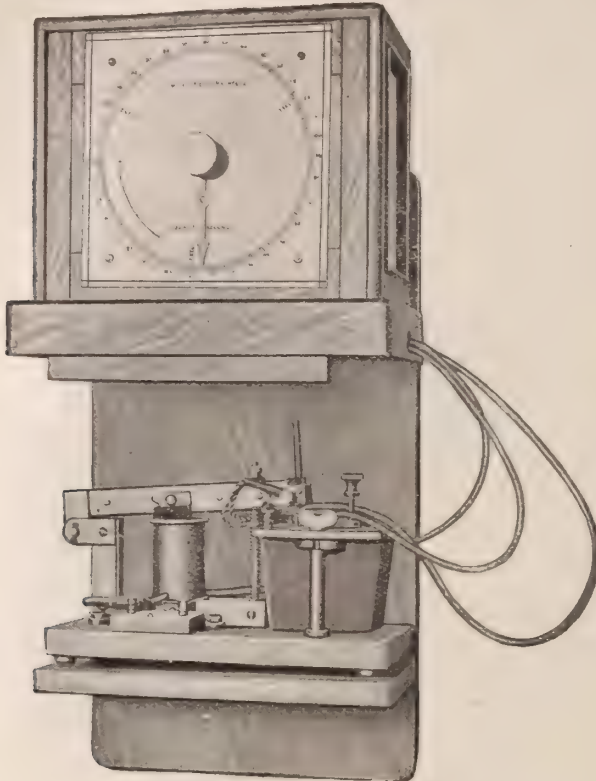


Fig. 6.—Impulse Timer.

on a scale. The circuit actuating the timing mechanism is broken at zero, so for one impulse the indicator is set at 1 before zero, for 2 impulses at 2, and so on to 360 (Fig. 6).

## DARK ROOM HINTS.

### METOL DERMATITIS.

Metol developers are prone to produce unpleasant staining of the fingers and even severe dermatitis. Many photographers are obliged to avoid the use of metol developers because of the severity of the skin effects.

Metol produces a dermatitis accompanied by ulceration which may result in fissures and cracks which are slow to heal. Before the skin is broken one may use soothing lead lotions. After the skin is broken, care must be taken to protect the parts and use bland ointments.

The following ointment is suggested in the *British Journal of Photography* (November 7th, 1913): Ichtyol, resorcin, glycerine, of each 1 oz.; zinc oxide,  $\frac{1}{2}$  oz.; white petrolatum, 6 oz.

As prophylactic measures, one may attempt to coat the hands with vaseline before beginning development. Again the *British Journal of Photography* (June 5th, 1914) recommends that 2 drops of pure carbolic acid be added to a quart of water; immerse the hands after using metol, and warm gently over gas flame to toleration. Then wash thoroughly in carbolic soap and dry well.

One will find photographic supply houses offering thimbles with a metal point attached which can be slipped under the edge of the plate to avoid prolonged metol contact. Also metal angles are used with one blade under the plate and the other projecting above the surface of the developing solution, the latter being grasped to elevate the plate out of the solution.

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#### WARM WEATHER DEVELOPMENT.

The warm weather brings trouble to the dark room. Solutions will not keep cool without ice. Tank development becomes a dubious procedure unless expensive cooling system tanks are installed. Stock solutions are best kept in an ice-box and the trays rinsed out with ice water before development. The use of actual ice in the developing tray is to be condemned. It not only dilutes the solution but it causes uneven development.

The one chemical to watch in the summer is the amount of sodium and potassium carbonate. These are contrast agents and should be cut down slightly in the summer.

If plates are dried slowly in a warm atmosphere they acquire contrast and black fog. Now, a fan blowing directly upon drying plates may spot them, owing to the arrest of a drop of water flowing down the plate and meeting the great wind resistance from the fan. But turning the fan away and drying the plates by pulling the air through the plates rather than pushing it through, may not be fast enough in summer to avoid heat fog in a warm dark room. Therefore, one may conveniently erect a cheese cloth frame between the fan and the drying rack to diffuse and break up the impact of the fan breeze upon the plates.

It must be remembered that oxidizable solutions deteriorate more rapidly in summer warmth, and therefore old solutions should be avoided except in developing simple fracture plates which can be easily and inexpensively repeated if necessary, but always declare a fresh cooled solution for the kidney, sinus or gastric exposure.

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#### ROENTGEN ITEM.

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#### THE COLORATION OF ROENTGEN TUBES AND LEAD GLASS SHIELDS.

The cathode rays 'reflected' from the anticathode are responsible either directly or indirectly for the violet color which the glass assumes in well used  $x$ -ray tubes. This coloration is most pronounced on the front side of the anticathode, and can be prevented



by screening the glass with metal foil. Radium rays affect glass and quartz in the same way, though to a greater depth; and cathode rays produce a similar colour in crystals of rock-salt or fluorspar. Possibly, therefore, the action is of the same nature in all these cases; and perhaps the phenomenon is related to the violet permanganate coloration produced by ultra-violet light and sunlight in window glass. The violet colour is in all cases destroyed by heating.

X-ray bulbs of lead glass become brown in colour rather than violet. Elster and Geitel (1898) have suggested that the various colorations are due to ultra-microscopic particles of reduced metal in the salt. (Quoted from "X-Rays," by Kaye, p. 83.)

## EPITOME OF CURRENT ROENTGENOLOGICAL LITERATURE.

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RADIOSCOPIC COMPRESSOR DIAPHRAGM (Bucky Type).—Holzknecht (*Arch. Roent. Ray*, 1914, Vol. XIX, p. 93) has perfected an apparatus to cut off the secondary radiation incident to fluoroscopic examinations, which he calls the Bucky compressor diaphragm.

He finds that in examining a corpulent patient, even with a small diaphragm screen-opening and compression with the fluorescent screen, the image on the screen is poor and lacking in outline. This is for two reasons: First, it is impossible to obtain rays of suitable degree of softness which will traverse the body, and, secondly, the radiosopic effect is due to momentary radiation, unlike the prolonged effect of photography. He recommends the use of a filter in all cases where the patient is subjected to fluoroscopy for any length of time. This protects the patient and a ray of greater intensity can be used, giving a more visible image.

Holzknecht explains that the fogging effect of the image is due to the secondary rays given off by everything in the field under examination. These rays cross and recross and impinge on the screen at different angles. It is to cut off these secondary rays that he has devised the 'Bucky compressor diaphragm,' taking advantage of the Bucky effect.

Bucky placed a grating diaphragm between the patient and the screen. This allows the rays from the tube to go through, but cuts off the secondary cross rays. Naturally the grating makes a shadow on the screen and furthermore the focus tube must be carefully adjusted or the rays will not go through the grating at the correct angle.

Holzknecht uses a conical wooden tube lined with lead, which is attached to the back of the screen. It can be removed until the preliminary examination is made, then adjusted over the suspected area. The localized area is brought out sharp and clear in the field. By making pressure, still greater contrast is obtained.

He finds it especially useful in detecting small foreign bodies. When these are in the eye or skull it is invaluable. He uses it to define the outline of organs and to show concretions and gallstones.

He is enabled to economize on focus tubes and reduce the dose of Roentgen ray absorbed by the skin. It is necessary to have the diaphragm in the right position and use a very hard ray, almost as hard as is used in deep radiotherapy, 8 to 10 Bauer, with  $2\frac{1}{2}$  milliamperes through the tube. The article is illustrated by several cuts.

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DIAGNOSIS OF DUODENAL ULCER.—Barclay (*Arch. Roent. Ray*, 1914, Vol. 19, p. 280) commends the work of those radiologists who

can make a 'positive diagnosis' of duodenal ulcer, but thinks there is still much to say for those who are not so positive. He does not agree that the small ulcers which are merely mucous erosions and will not show the bismuth niche are few in number and unimportant. He argues that every ulcer must have a small beginning, that while it is the well-developed ulcer that gives rise to constantly recurring digestive disturbances and sometimes hemorrhage, it is in the early stages before definite symptoms have developed that the ulcer is an acute danger to life.

Barclay believes that the symptoms ascribed to ulcer are due to the duodenal irritation and not to the ulcer; that the ulcer is due to the irritation. This irritation may or may not cause an ulcer. Hence we may have a clinical duodenal ulcer without any deformity to cause a shadow. The well-known fact that these ulcers tend to heal and recur, very likely causes scars which may produce deformities and pits on which the so-called 'positive diagnosis' depends. The ulcer is a more or less accidental sequel to duodenal irritation. This irritation is a secondary manifestation, and that the symptoms may be relieved by an operation is no argument for or against this view. The detection of the ulcer does not matter so much, but we should devote our energies rather to seeking out and removing the cause of the duodenal irritation.

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GASTRO-INTESTINAL CONDITIONS WITH ESPECIAL REFERENCE TO APPENDICITIS.—Hertz (*Arch. Roent. Ray*, 1914, Vol. 19, p. 249) believes that evidence furnished by Roentgen examinations enables a definite diagnosis to be made in a large majority of cases of chronic appendicitis. The evidence is both direct as to the appendix itself, and indirect as to the effect of the chronic appendicitis on the rest of the alimentary canal. In the examination for direct evidence he uses a small diaphragm and pushes the cecum and ileum from side to side. The appendix can be seen in 50 per cent. of normal people. Its position with reference to the cecum and ileum is important, as a misplaced appendix may simulate other conditions. The presence of adhesions can be recognized by deep palpation during screen examination. If the cecum is in the pelvis it can sometimes be drawn up by manipulation. He suggests, before a diagnosis of ileal kink be made, *that the bowel be inflated, since that which appeared to be an adhesion may separate.*

He says that when palpating the appendix under the screen, it may be found to be tender when no tenderness had been noted before, while, on the other hand, when the appendix is pushed aside the tenderness may be found not to be in the appendix at all. An examination should always be made before the barium meal, so that concretions and other foreign bodies may be seen. Of the indirect evidence, he looks for hypertonic conditions and hour-glass constrictions of the stomach, increased ileal stasis, and an unusually mobile and an abnormally large cecum.

Hertz says that chronic appendicitis is one of the most common causes of enterospasm, the Roentgen ray showing that the lumen of the colon is abnormally narrow in places.

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TREATMENT OF ACUTE ROENTGEN RAY DERMATITIS.—Dodd's article (*Amer. Journ. Roent.*, 1914, N. S. Vol. I, p. 430) was prompted by the possible renewal of untoward Roentgen effects incident to the



installation of powerful apparatus in small hospitals with unqualified and untrained operators in charge. The Coolidge tube has added another source of danger in the hands of those ignorant of its power.

Twelve cases of Roentgen dermatitis were seen by Dodd in 1914. Seven cases of alopecia from frontal sinus exposures, which were due to repeated exposures rather than long individual exposures; three resulted from small high frequency coils used in dental work; two from fluoroscopic examinations to determine a Pott's fracture.

As a preventive treatment, Dodd recommends bathing the parts in bicarbonate of soda solution. Further experiments to establish the uniform success of the bicarbonate treatment will be published soon.

For acute Roentgen dermatitis Dodd recommends the following white-wash:

Zinc oxide . . . . .	1/2 oz.
Phenol . . . . .	1/2 dr.
Glycerine . . . . .	1 dr.
Aquæ calcis . . . . .	8 oz.

Directions: Shake well and bathe area for five to ten minutes, twice or three times daily. Avoid heavy dressings, and when possible expose lesion to the air. Do not apply the remedy on a dressing and allow to remain for five or ten minutes, but sop it on and let the air get to the lesion. Under no circumstances use an ointment. Use a fresh quantity of wash every time it is applied and do not leave exposed to the air.

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CHRONIC RADIODERMATITIS.—Doumer (*Arch. Roent. Ray*, 1914, Vol. 19, p. 126) treats chronic radiodermatitis by the same means which he has found successful in acute radiodermatitis. He reports 3 cases—2 radiologists, and 1 showman who exposed himself to the x-ray in a side-show as an attraction. First case had had a dermatitis of moderate intensity since 1898, and was first treated in 1905. Second case was dermatitis of both hands and very severe. Third case had numerous patches on his back and right hand. Results are all good; skin looks normal, and the wrinkled appearance of the skin has in part returned. Doumer uses light but prolonged massage with 20 to 30 per cent. lipoic acid pomade applied with the finger-tips. This is used night and morning, and every other day he gives negative high frequency effluve to the affected parts which have been covered with a thin layer of lipoic acid pomade. Each seance lasts ten to fifteen minutes. He reports that the amelioration was marked in the first fortnight.

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DISEASES OF THE ACCESSORY SINUSES.—George (*Amer. Journ. Roent.*, 1914, N. S. Vol. I, p. 432) presents six beautiful postero-anterior skull roentgenograms which serve to emphasize the fact that extraordinary photographic detail and correctness of focus do not tell the whole story. Experience in reading accessory sinus roentgenograms is the essential factor to which the above attributes are meritorious advantages.

CHRONIC INTESTINAL STASIS.—Fluoroscopic and X-Ray Diagnosis in the Light of Operative Findings.—Bainbridge (*Amer. Journ. Roent.*, 1914, N. S. Vol. I, p. 404) makes the splendid suggestion that interpretative ability in abdominal roentgenology will be greatly increased if the roentgenologist will follow his cases to the operating room to check up the Roentgen findings. The author dismissed, as proved, Lane's contention that adventitious bands *do* form about certain portions of the gastro-intestinal tract, the end-result of which is a toxic condition resulting from the absorption of poisons from the intestinal tract, and further contends that the checking-up method in which the surgeon and radiologist co-operate at the operating table will go far toward dispelling any doubts still in the minds of those studying the matter. He adheres to Lane's views of the mechanics of the great drainage scheme of the body, and reiterates Lane's contention that upright posture promotes the crystallization of lines of stress and strain into definite bands. Bainbridge frequently eulogizes the pioneer Roentgen studies of Jordan, who emphasizes the necessity of fluoroscopic observations. Jordan is quoted freely. Bainbridge's modern scheme of co-operation is as follows: The roentgenologist presents the findings by radiograph and fluorescent screen before operation; a stenographer in the operating room takes the dictation of the operative findings; a medical illustrator makes a rough sketch of the conditions as demonstrated by the surgeon.

Appended to this article are reproductions of radiographs and operation-room sketches of 11 cases, which lend themselves to a critical review rather than an abstract.

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THE X-RAY DIAGNOSIS OF GASTROPTOSIS.—Pancoast (*Penn. Med. Journ.*, 1914, Vol. XVII, p. 540) states that from the *x-ray* standpoint alone that it is frequently a difficult matter to decide just when gastroptosis, as a pathological condition, really exists, and that there is no better opportunity for Roentgen findings to convey erroneous impressions or to become misleading than in a diagnosis of gastroptosis that is not founded upon an accurate knowledge of normal anatomic relations and radiographic appearances; and further, that it is an important object of the Roentgen examination to look for possible causes of symptoms other than gastroptosis. The essential change in a ptotic stomach is elongation vertically, due either to atony or to a congenital or acquired low position of the pyloric and duodenal attachments, or usually to both. As atony is an essential feature of true gastroptosis, the stomach is dilated, giving to the picture of the partly filled organ the appearance of a descended lower portion into which the opaque meal has descended, while the median portion is empty or only partly filled and narrow. A stomach with good tone grasps its contents and keeps filled in a comparatively uniform manner throughout. Given a case of suspected gastroptosis, the roentgenologist first determines whether or not the typical Roentgen picture of the condition exists, *giving due consideration to the anatomical type of the individual*. Following this, he observes the extent of ptosis, the degree of atony, and delay in the emptying time. Next, he must be assured that the position of the stomach is not

due to extragastric causes, such as pressure or traction. Knowing that an apparent ptosis may exist without symptoms, he must determine whether the atony and dilatation and the other factors in retention are those truly associated with a gastropstosis, or arise from other causes, such as pyloric spasm, pyloric obstruction, or duodenal stasis from traction on the mesentery through adhesions of the ileum or a ptosis of the right half of the colon.

It is always important to examine the intestinal tract in these cases, because of the possible factors to be found therein, and as an aid to the surgeon in planning his operative procedure. The examination may be of further service if the roentgenologist furnishes information additional to the essential facts already considered, such as the position of the liver and its relation to the lesser curvature, the degree of its movability, the position of the colon and kidneys, movability of the cecum, the presence of intestinal adhesions, kinks, or redundancy, and the likelihood of suitable gastric drainage being obtained without gastroenterostomy. Pancoast concludes that the Roentgen examination is the best method of determining the anatomical results of operative measures in the improvement in any pathological defects that preceded operation or other remedial measures.

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BISMUTH IN THE BRONCHIAL TREE IN ESOPHAGEAL CARCINOMA WITHOUT PERFORATION OF THE AIR-PASSAGES.—Weingärtner (*Fortschr. auf dem Geb. der Roentgenstrahlen*, 1914, Bd. XXII, p. 397) says that from what he has seen in looking over Roentgen literature, the observations until now on bismuth in the bronchial tree of the living were derived altogether from carcinoma of the esophagus which broke through toward the trachea or bronchus. He has seen similar cases in whom the perforations were found by means of the broncho-esophagoscope or on the dissecting table. He states that in his clinic three patients were observed in whom bismuth was present in the bronchial tree, but on whom no perforations could be established.

In 3 cases of carcinoma of the esophagus, bismuth was observed fluoroscopically in the bronchials; in one case at autopsy a connection between esophagus and tracheal-bronchial system was not indicated. All 3 cases showed paralysis of the laryngeal muscle.

The question whether the food, getting into the larynx was not somewhat favored by sensory disturbances of the laryngeal mucous membrane, can be answered by the fact that important disturbances of this kind were noted in 3 cases. The author believes that there is a slight reduction of the sensibility not accounted for by changes in the superior laryngeal nerve, but due rather to the laryngeal mucous membrane becoming accustomed to foreign substances.

At all events, the observations prove that the penetration of various foods into the bronchial tree from the esophagus is not by any means characteristic of a tracheal or bronchial fistula, especially in cases where paralysis of the laryngeal muscle is present. As a result of esophageal carcinoma there is the possibility of bismuth flowing into the tracheobronchial tree through the larynx.



## BOOK REVIEWS.

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RADIOGRAPHY, X-RAY THERAPEUTICS AND RADIUM THERAPY. By Robert Knox, M. D. (Edin.), M. R. C. S. (Eng.), L. R. C. P. (Lond.), Hon. Radiographer, King's College Hospital, London, etc. etc. With Sixty-Four Plates, Two Hundred and Forty-Six Illustrations in the Text and a Frontispiece in Colour. New York: The Macmillan Company. 1915. Price, \$8.00.

A careful analysis of this beautiful book by Dr. Knox forces the acknowledgment that it is undoubtedly the most satisfactory treatise upon radiography, roentgentherapy and radiumtherapy in the English language. One is first impressed with the clean, clear pages, the quality of the paper, and more especially by the unique and original method in the Roentgen illustrations. Side by side are reproductions both of the negative and the positive of each case illustrated, which results in a most illuminating and instructive method of teaching Roentgen interpretation.

The author is an English authority in roentgenology. He has succeeded Dr. Deane Butcher as editor of the "Archives of the Roentgen Ray." His hospital connections are formidable, as he is the Honorable Radiographer to the King's College Hospital, London, Director of the Electrical and Radiotherapeutic Department of the London Cancer Hospital, and is the Honorable Radiographer to the Great Northern Central Hospital, London, etc. He enjoys the confidence of all roentgenologists who have followed Roentgen literature over a period of years.

A book evolved out of the practical experience of such a wealth of clinical material is bound to furnish a splendid estimate of radiographic and roentgentherapeutic values.

The chapters upon normal and abnormal bone interpretation are amply illustrated, although the text is surprisingly brief upon certain differential points. The chapter upon the thorax surpasses the chapter upon gastrointestinal roentgenology, which is probably due to a more courageous confidence in the exactness of thoracic interpretation.

Nearly one-third of this book is devoted to radiation therapeutics. Dr. C. E. S. Phillips has written the section upon the Physics of Radium and Mr. E. H. Shaw has added the pathological descriptions of sections from tumors treated by radiations. A spirit of conservatism pervades the chapters upon roentgentherapy. It is gratifying to hear from a radiotherapist of Dr. Knox's experience that it is probable that Roentgen rays may soon prove to be more useful than radium, as it is at present used, due to the marked advances in  $x$ -ray technique.

Undoubtedly, this book will be the ranking textbook on roentgenology in the English language. It is markedly devoid of references to Roentgen literature, but rather careful scrutiny determines that the author has included a discussion of many moot questions, especially in the chapters upon gastro-enterology, which division of roentgenology has not been standardized.

The book is unreservedly recommended to Roentgen workers and to physicians and surgeons who may be seeking to increase their knowledge of Roentgen interpretation.

TECHNIK DER SPEZIELLEN KLINISCHEN UNTERSUCHUNGSMETHODEN. Herausgegeben von Prof. Dr. Theodor Brugsch, I. Assistent der II. medizinischen Universitätsklinik in Berlin, und Prof. Dr. Alfred Schittenhelm, Direktor der medizinischen Universitätsklinik in Königsberg i. Pr. Zwei Bände. I. Teil. Mit 359 Textabbildungen. Berlin und Wien: Urban und Schwarzenberg. 1914. Price, 40 m.

In this first volume of the revised second edition, Brugsch and Schittenhelm have called upon specialists to assist them in presenting a complete analysis of special clinical examination methods. Nicolai contributes upon electrocardiography and Janus, of Berlin, collaborates with Schittenhelm in an extensive 150 page chapter on roentgenological methods. Immunity diagnosis is elaborated by Weichardt, of Erlangen.

This work deals purely with the scientific technique of the highly specialized examinations now becoming more generally employed in the modern practice of medicine. It is not a book for the average practitioner of medicine; rather would it serve as a reference encyclopedia to the erudite consulting diagnostician. The Roentgen chapter is a good example of the completeness in technical information which is displayed in every other chapter in the book.

This book will find a favorable reception in research laboratories connected with clinical departments of teaching universities. It is distinctly a German book in that it fails to record or at least does not attribute much clinical research to original English or American sources. This is not a fault but rather a characteristic. German clinicians have been besieged by American medical students (?) for years. Their opinion of the average American medics is probably not highly eulogistic. Therefore they do not look for original research methods among other nations.

The completeness and comprehensiveness of the book is its best recommendation. It contains no diagnostic paragraphs, but gives the pure scientific methods for clinical laboratory technique.

The inclusion of the Roentgen chapter is prophetic of a budding specialty—that of the trained laboratory technician. This new specialist will be a sort of super-physician. He will be the practitioner's helper and guide. He will be trained in all manner of laboratory examinations with which the practitioner may seek to enhance his patient's welfare.

These various accessory clinical necessities are covered in this book, to-wit, blood analysis, air analysis, electro-cardiography and roentgenography, pneumography, bacteriological examinations and immunity diagnosis, pathologico-histologic examinations, optical, optometrical and colormetrical studies. The second volume, which has not yet been published, will contain chapters on cystoscopy, esophagoscopy, and all the other little 'scopies.'

One finds in compact and practical form the various methods of clinical laboratory analysis, satisfactorily arranged in a volume of convenient size. Such an addition to a laboratory's library will save much delving into larger reference volumes.

**A TEXT-BOOK OF RADIOLOGY.** By Edward Reginald Morton, M. D., C. M. (Trin. Tor.), F. R. C. S. Ed., etc., Past President, Section of Electrotherapeutics, Royal Society of Medicine, in Charge of the X-Ray Department, West London Hospital, etc. etc. With 26 Plates and 72 Illustrations. New York: E. B. Treat and Company. 1915. Price, \$3.00.

This volume does not aim at being comprehensive but is rather a useful guide for beginners in roentgenology. The author is a well-known English roentgenologist and electrotherapist who is qualified to guide the Roentgen neophyte.

There seems to be a studied avoidance of the term 'Roentgen.' The title word 'radiology' is an adaptation from the French. This latter term has been eliminated practically from American literature by the adoption of the new Roentgen nomenclature by the American Roentgen Ray Society in 1913, when it was thought that the term radiology was too inclusive and rather implied the use of radium and all other forms of radiant energy.

In opening the chapter on Interpretation, Morton says that the best time to examine an x-ray plate is immediately after it is removed from the fixing bath, or during the subsequent washing. This is at variance with American practice and is hardly good advice to beginners, because the heat generated by any viewing box and the accidents possible to wet plates may spoil a perfectly good plate.

One can, however, consistently recommend this volume to beginners, and even experienced roentgenologists will find many items of interest which the vast experience of the author forces into every paragraph. There are no redundancies in this volume. It is easy and profitable reading, and should have a big sale among the rapidly increasing adherents to Roentgen diagnosis and therapy.

**DISEASES OF THE STOMACH.** Including Dietetic and Medicinal Treatment. By George Roe Lockwood, M. D., Professor of Clinical Medicine in the Columbia University; Attending Physician to Bellevue Hospital, New York. Illustrated with 126 Engravings and 15 Plates. Philadelphia: Lea and Febiger. 1915. Price, \$5.50.

This book upon gastroenterology gives an unusual amount of original information both upon gastric diagnosis and therapy. This edition carries many pages and illustrations upon the Roentgen ray in gastric diagnosis



that convey the conservative estimate which a clinical gastroenterologist holds for this new diagnostic agent. It may be well for the enthusiastic roentgenologist to read these pages and see the point of view of the clinician who must correlate the reports from the chemical and Roentgen laboratories and keep his patient constantly in mind at the same time.

Lockwood has written this book out of a large practical experience, and the personal testimony upon the values of symptoms, analysis, etc. will interest the general practitioner and specialist alike. Series of cases have been grouped and analyzed, and the results noted, whether or not these results have been in harmony with preëxisting ideas.

A happy feature of this book is the last chapter in which Lockwood describes the gastric symptoms of various extragastric lesions. Appendicitis receives ample discussion, but the few paragraphs upon the gastric symptoms referable to gall-bladder disease seem somewhat abbreviated.

This book will be both profitable and interesting to those who are inclined to listen to the experienced observer rather than to the textbook type of author. The pathological illustrations are beautifully executed and amply described.

HANDBUCH DER ROENTGEN-LEHRE ZUM GEBRAUCHE FÜR MEDIZINER. Von Prof. Dr. Hermann Gocht, Spezialarzt für Orthopädische Chirurgie zu Halle a. S. Vierte umgearbeitete und vermehrte Auflage. Mit 249 in den Text gedruckten Abbildungen. Stuttgart: Verlag von Ferdinand Enke. 1915. Price, 13.80 m.

The fourth edition of Gocht's standard German textbook on roentgenology is a most satisfactory publication. Gocht occupies a permanent niche in the Roentgen world, not only by reason of this popular textbook but because he established the first good Roentgen index. Roentgenology, being a youthful specialty, and being born within the modern period of extravagant medical literature, lends itself to complete bibliographic indices.

This last edition of Gocht's shows the influence of his extensive command of universal Roentgen literature. He quotes authoritative references frequently, which adds to the worthiness of this book as a guide and textbook. It is to be hoped that this book will be translated into our language or that some skillful American roentgenologist selects Gocht as a model. The book is conscientiously recommended.

ESSENTIALS OF MEDICAL ELECTRICITY FOR MEDICAL STUDENTS AND NURSES. By George Knapp Abbott, A. B., M. D., Professor of Clinical Medicine, College of Medical Evangelists, Loma Linda, California. Illustrated. Philadelphia: W. B. Saunders Company. 1915. Price, \$1.25.

Electrotherapeutics is much abused and misused. As Abbott remarks, "Like many good things, it has suffered most at the hands of its would-be friends." This small elementary textbook provides a brief manual on electrotherapy in such simplified terms as to make it serviceable for instruction and yet complete enough to cover the fundamental principles. The book is amply illustrated by reproductions of apparatus and intelligible diagrams of the different currents and modalities. It is especially recommended to medical students and nurses.

BULLETIN ON STUDIES IN ROENTGEN RAY DIAGNOSIS. By A. C. Christie, M. D., Captain, Medical Corps, U. S. Army, Washington, D. C.: Government Printing Office. 1915. Price, 30 cts.

The War Department, through the Surgeon General's office, has published some seven monographs which expose scientific researches or studies pursued by ambitious army surgeons. The seventh in the list is by Captain A. C. Christie, entitled "Bulletin on Studies in Roentgen Diagnosis." There are 35 pages of the text, mostly occupied with gastro-intestinal roentgenology, to which are attached 63 good Roentgen reproductions. There are 29 case reports in which the Roentgen examinations were checked by operation or autopsy. The spirit of the text is commendably conservative.



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## EDITORIAL.

### THE CANCER PROBLEM.

It seems evident that we have reached a definite stage in our knowledge of cancer. The publication of the several large handbooks which have appeared in the last few years are significant of the fact that the mass of knowledge which has been gathering for many years has now attained such proportions and such quality that the collection and correlation thereof is of value for the further development of our efforts. The monumental handbook of Wolff, which sums up all our knowledge regarding cancer, will probably be for some time to come the classic. The recently published book of Bainbridge\* which, while much shorter than the German publication, touches upon all the important phases of cancer, will be of great aid to the man who desires to find summarized most of the important work done in this field. It seems safe to say that the appearance of these books is the result of a need of the physician, the statistician, and the laity.

As a result of the propaganda which was first started on the Continent, and which has been taken up more recently in this country, many members of all three of these classes of individuals have been enlightened and feel the need of further education in the danger, the occurrence, and the treatment or the possibilities of treatment of neoplasms. It seems, therefore, that the ground is now fertile for the widespread dissemination of knowledge; and let us hope that the influence of the present and all future educational efforts will gradually become more and more evident by the reduction of the occurrence and the early diagnosis of cancer, and the

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\*The Cancer Problem. By William Seaman Bainbridge, A. M., Sc. D., M. D. New York: The Macmillan Company. 1914.

recognition of those conditions which experience has taught us may lead to cancer; and finally that the efforts which have been directed toward finding some means of combating this condition may receive the support which such earnest endeavors deserve, and may furthermore be guided in the right path by the work which has been done heretofore.

One fact has been made evident by the work produced in the past decade—that is the protean aspect of cancer: the very broad view which we must take of the subject whether we consider this disease from the standpoint of etiology, diagnosis, or treatment.

It was not so very long ago that the upholders of the parasitic and the upholders of the non-parasitic origin of cancer were irreconcilably at odds, but now, although the most ardent upholders of the two theories may not be willing to admit it, there has been much evidence adduced to show that both may be correct. It seems quite definitely proved that we must consider two causes in each case, one of these an external and the other an internal factor. Exactly what each one of these two causative elements may be, what degree of intensity of action of each one is essential, we do not know, nor have we any evidence to afford a basis for these calculations. It does seem quite possible that in some cases the external factor may be a parasite, either bacteria, protozoa, or some higher animal parasites such as have been reported as associated with tumors. It does not, however, seem that we can state that every case may arise from an external parasitic origin, and in many cases we must fall back upon the old idea of an external mechanical irritation. What the internal factor or factors which we must consider among the etiological conditions may be, we cannot state; we do know that various lesions have been produced experimentally which simulate cancer and which are due to definite internal and external factors, but we have no grounds to believe that these same internal conditions will also play a part in malignant neoplasms. It is, however, scarcely possible that anyone will be able to belie the dual origin of cancer, dependent upon external and internal factors; and it is in addition most probable that in the development of each and every case there has been a different combination of factors at work.

In dwelling so upon the more general etiology we do not mean to ignore the relation of the cancer problem to biology; but the consideration of this phase of the problem does not lend itself to brief summarization, and is still removed from application to the educational and utilitarian side.

In diagnosis we have not yet found a definite sign which will tell us of the presence of cancer of the inner organs, but the extensive chemical researches have shown that in many of its manifestations cancer must be regarded as more than a localized disease. We have not the license to state that it is a disease of general nature, but only to state that in many cases the effects, whether secondary or not, have influenced metabolism in distant parts of the body.

The evidence brought forth by the Abderhalden test seems finally to set at rest the moot question as to whether there are produced in the affected individual 'immune bodies'; we cannot but consider the specific ferments for cancer tissue, which can be shown to exist by means of this test, as anything but very closely related to the so-called 'immune bodies.'

Furthermore, in the microscopic diagnosis of cancer there has been a most important advance in the education of the profession; whereas formerly the clinician demanded from the pathologist a definite yes or no as regards malignancy, the two diagnostic workers now have found a common ground of understanding, and the clinician is growing more willing to allow the pathologist to act in an advisory capacity as to the course of treatment or the necessity for further observation. There can be little doubt but what this co-operation between the laboratory worker and the man upon whom devolves the handling of the affected individual has made for the benefit of the latter. The general recognition of precancerous conditions and of borderline conditions, which clinically should be considered as malignant, has done much to clear the atmosphere.

When we turn to consider our present knowledge of treatment we cannot be as sanguine over the achievements as we have been in considering other phases of the cancer problem. We have not produced a cure and cannot even state that we have material at our disposal which definitely points the right direction to seek for one. It may be that the chemotherapeutic lines which have been tried experimentally will prove, on further development, to be those which will lead to eventual success; but to-day we must strike out rather blindly in the direction of the sought-for cure, and by the exercise of patience eventually hope to reach our goal.

We need not, however, record only failure in the advancement of our methods of treatment; certainly the improvement in handling the *x*-ray and the introduction of more powerful gamma rays, as well as the use of radio-active substances, represent distinct advances and means of influencing certain cases which formerly were beyond our aid.



Therefore the stage which we have reached is not one at which our satisfaction lies in our retrospect of work accomplished, but rather one at which we marshal our power for work which is still to be accomplished. It is evident in what directions we must push our investigations in order to be of the greatest service in the future, and we realize the great service which can be accomplished by the systematic education of the public and the profession. The key-note of cancer work for some time to come must be education, and the facts which should arouse the suspicion of lay individuals must be brought home to them and must be constantly held up before them in order to make the necessary impress. And finally the physician must be made to realize those conditions which may lead to cancer, and to follow carefully the course of such conditions in the patient. We should beware of hysteria, but let us rather have fanaticism for some time with an eventual recoil to common sense than continued carelessness upon the part of the laity and the profession.

M. S. F.

## ORIGINAL ARTICLES.

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### EARLY MANIFESTATIONS OF MALIGNANT DISEASE. ILLUSTRATIVE CASES.

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By WILLIAM SEAMAN BAINBRIDGE, A. M., Sc. D., M. D., C. M.,  
of New York.

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Malignant disease may at times be one of the paradoxes of pathology. That which is seemingly malignant sometimes is entirely benign *per se*; and that which is apparently harmless may be potentially and actually quite the reverse. It is one of the problems of the prevention and cure of cancer to safeguard the patient from too radical a handling of the first horn of the dilemma, and from too conservative handling of the second. And it is one of the problems of the campaign of education against cancer to steer the public along a safe path, from which they will not deviate toward the stumbling-block of too great optimism on the one hand or too great pessimism on the other.

Attention has been called elsewhere\* to the difficulties involved in this question, and I wish here to emphasize certain points, as nearly as is possible by means of illustrative cases.

The development of anything like a system of prophylaxis regarding cancer is coincidental with the inauguration, within the past fifteen years, of the era of experimental cancer research. Since that time efforts to solve the problem of the cause, and likewise the prevention, of cancer have assumed a character different from that of all previous investigation. Failure to establish the correctness of any of the proposed theories concerning the essential cause of the disease led investigators to concentrate their attention upon the factors which might be proved to exercise a predisposing influence in its etiology. It was hoped, in this way, to discover the essential cause by working out from the predisposing causes.

Accordingly, many research laboratories inaugurated a series of experiments upon short-lived animals, with a view to establishing the influence of heredity, irritation, environment, diet, and

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\*The Campaign of Education Against Cancer: Educational, Experimental and Clinical. (*Am. Jour. Dermatology*, 1911, Vol. XV, No. 7.)

The Cancer Problem. New York. 1914. Section II (Predisposing Causes), Section VIII (Prophylaxis), Section XIV (the Campaign of Education Concerning Cancer).

various other matters which were thought to be possible sources of information along these lines. Coincidentally with these experiments upon animals, observations with respect to the various predisposing causes of cancer having a direct bearing upon its prevention and cure have been made upon human subjects. Perhaps the most practical outcome of such study is the emphasis to be placed upon the elimination of all possible sources of chronic irritation, and the removal of benign neoplasms which are or which are liable, because of their situation, to become subject to irritation.

In the latter connection a great deal of important work has been accomplished, yet there is much more to be done. Interest in many apparently benign and harmless conditions has become focused upon the question of their potentiality as the forerunners of cancer. There has come into use, because of this, the term 'precancerous,' as applied to benign neoplasms and other conditions. This term, however, may be challenged because of the risk implied by waiting for cancer to develop. Nevertheless, so far as we know at the present time, certain local tissue manifestations which, in the life history of one individual, may continue to pursue a benign course, may merge into a malignant course in another individual. It is manifestly extremely difficult and many times impossible to predict when the borderline between the precancerous and the cancerous is reached. This very difficulty imposes upon each member of the profession, whether general practitioner, surgeon, or other specialist, the obligation of giving serious attention to all conditions, however harmless in themselves, which may predispose the individual to the development of malignant disease.

It is now widely conceded that various benign or noncancerous conditions may become cancerous. The responsibility for the prevention of some forms of cancer, therefore, is in large measure justly placed upon the general practitioner, the dermatologist, and the specialist in other fields. These are usually consulted for some purpose before the surgeon is called upon to operate for cancer. I am convinced that a large proportion of severe and often fatal malignant neoplasms may be traced to apparently insignificant and harmless warts, moles, *nævi*, and scars, which have been subjected to irritation, mechanical, or otherwise, and which, in the earlier stages, would have been easily and completely removable by surgical means. It is not to be inferred from this, however, that every tiny wart or mole, or other skin blemish, and every lump and bump on any part of the body, is to be ruthlessly removed. Many of the conditions which come under this category, when not subjected to repeated acute traumatism or to chronic irritation, give no trouble in healthy persons whose lives are regulated on a well-ordered plane. In many instances, however, in a favorable host, and under



favorable conditions, as when subjected to constant irritation, or to repeated injury, these otherwise harmless lesions become definite sources of danger, and in such cases removal is obligatory. Neglect in this regard is very apt to find the borderline between benign and malignant crossed sooner or later. The individual then becomes the subject of early cancer, which may still be lightly considered or perhaps entirely neglected. Many of the cases of advanced and irremovable cancer give just this history.

The following cases illustrate different phases of the precancerous and early malignant lesions which, when properly attended to, forestall the graver conditions.

CASE I.—L. E., female, *æt.* fifty-seven, admitted to the New York Skin and Cancer Hospital, June 5th, 1912, for treatment for the growth on the forehead, shown in Fig. 1. In the right temporal region is also to be seen a small melanotic mole, still quiescent. The growth on the forehead, which had appeared as a small mole, remained quiescent for twenty years or more, had taken on slow growth following a scratch, inflicted accidentally four years before. Both neoplasms were excised. Under the microscope the one from the temporal region proved to be a melanotic mole, with no apparent malignant tendency; the one from the forehead was epithelioma.

CASE II.—S., female, *æt.* seventy. Admitted to the New York Skin and Cancer Hospital, April 3rd, 1915, with the condition shown in Fig. 2. This started several years before as a small 'sore' on the side of the nose near the inner canthus of the left eye. It grew slowly until it reached the proportions shown. The growth was excised, and the area fulgurated. Pathological examination verified the clinical diagnosis of epithelioma.

CASE III.—B., female, *æt.* eight months. Admitted to the New York Polyclinic Hospital, January 3rd, 1913, for advice concerning the condition shown in Fig. 3. The growth, situated on the side of the nose, below the inner canthus of the left eye, had rapidly increased in size until it was about the size of a hickory nut. It was excised, and proved, upon pathological examination, to be angiosarcoma.

The region around the bridge of the nose and inner canthus of the eye is a favorable one for extension because of the peculiar structures in the vicinity, and some of the most rapidly growing and fatal malignant neoplasms are found in this locality, in children as well as in adults. It is, therefore, especially important that no abnormal tissue manifestation here be overlooked or neglected.

CASE IV.—L., male, *æt.* four. Brought to me, April 17th, 1915, for advice regarding a brown mole at the outer canthus of the right eye, as shown in Fig. 4. This brown spot was about the size of the end of a lead pencil when the child was born. It grew gradually and became darker, increasing in size very rapidly of late, until it was about the size of a silver dollar. It was excised, and proved, upon pathological examination, to be a "melanotic mole, growing rapidly, showing suspicion of early malignancy," the examination having been made by Dr. J. M. Jeffries, pathologist to the New York Polyclinic Hospital.

CASE V.—M., female, *æt.* forty-eight, when admitted to the New York Skin and Cancer Hospital, February 4th, 1914, for treatment for the growth on the

side of the nose, shown in Fig. 5. This began as a small wart, irritated by constant picking at it and beginning to grow, caused her uneasiness, and she sought advice. It was excised, and proved to be epithelioma. Left alone, it might have remained quiescent for a number of years longer, but the chances are it would eventually have undergone malignant change.

CASE VI.—W., male, *æt.* fourteen months. Brought to me, August 11th, 1912, for the growth on the face, shown in Fig. 6. This was first noticed when the child was three weeks old, as a slight redness under the skin. It remained unchanged until he was about four months old, when it appeared on the skin, growing very much as a mole, except that it was blood-red. It remained the same for several weeks, then underwent the change, and gradually grew to be quite perceptible. The growth was excised, and the pathological report was hemangioma telangiectoides.

We have here a 'mother's mark' which became elevated and which began to grow sufficiently rapidly to indicate that it would have become a serious menace had it not been promptly removed.

CASE VII.—O., female, *æt.* sixty. Referred to me for treatment for the growth on the right side of the face, between the wing of the nose and the angle of the mouth (Fig. 7). This began as a small pimple, a year before, developing to the size of a French pea. It was elevated and red, without crusts, sometimes painful, sometimes bleeding. It had been treated by her family physician with zinc oxide ointment for two months, the patient objecting to operation. Lately, she consulted me, but still refused to undergo operation, and was treated with radium.

The diagnosis is one of undoubted epithelioma.

CASE VIII.—M., female, *æt.* fifty. Admitted to the New York Skin and Cancer Hospital, April 22nd, 1915. Examination showed epithelioma behind the right ear, and a spot of lupus vulgaris, with epithelioma superimposed, on the left cheek. These growths were excised, the glands of the left side of the neck were removed, and the areas fulgurated. Clinical diagnosis was confirmed by microscopic examination. Fig. 8 shows the site of the face lesion.

The condition behind the ear, which was plainly epitheliomatous as judged by clinical appearances, was neglected, whereas the lupus on the cheek, which was not malignant, was subjected to repeated cauterization at the hands of her family physician. It is impossible to say, of course, just how much influence this treatment had in giving rise to malignant degeneration of this area of lupus, but it is fair to assume that the repeated irritation by the caustic had a definite influence in this direction.

CASE IX.—S., female, *æt.* sixty-one, admitted to the New York Skin and Cancer Hospital, October 9th, 1908. The condition for which she sought advice is shown in Fig. 9. It proved to be a small sebaceous cyst, with epitheliomatous degeneration in the centre. The patient had diabetes at the time, for which she was treated, the sugar soon disappearing from the urine. The cyst with the growth was removed, and the patient has been well since.

The influence of diabetes upon the tissues with reference to malignancy is a matter still under investigation.

CASE X.—M., male, *æt.* forty-four, consulted me November 22nd, 1913, regarding a mole on the right side of the face, between the wing of the nose and the angle of the mouth (Fig. 10). This appeared six years before, remained quiescent for four years, then began to grow, until it became about half as large as a ten cent piece. A year before he consulted me he applied a caustic acid, causing its temporary disappearance. It was removed under local anesthesia, and the pathological examination showed it to be epithelioma.

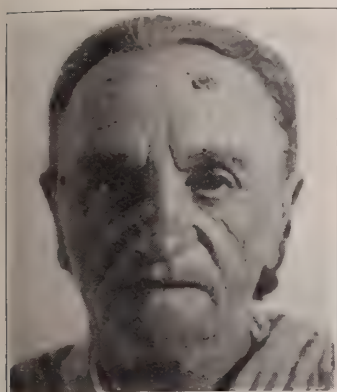


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

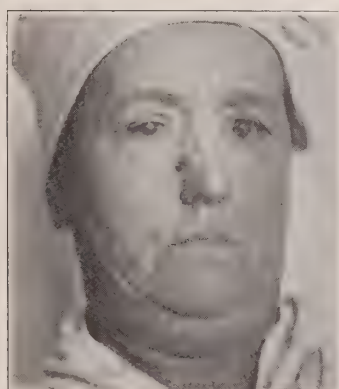


Fig. 5.



Fig. 6.

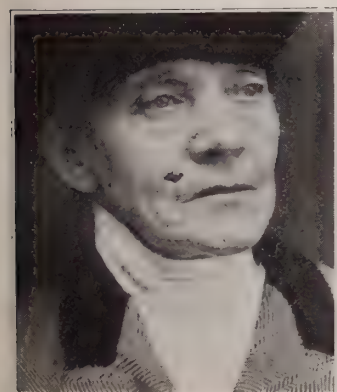


Fig. 7.



Fig. 8.

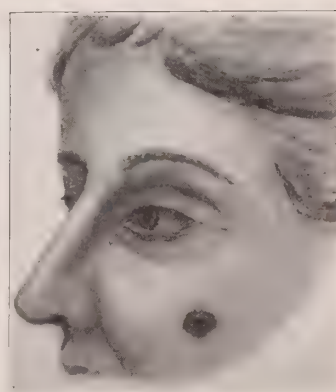


Fig. 9.



CASE XI.—F., female, *æ*t. thirty-nine, admitted to the New York Polyclinic Hospital, March 10th, 1911, for removal of a lipoma on the shoulder and an angioma on the lower lip. The lipoma on the shoulder had existed for a number of years, and the angioma on the lip (Fig. 11) for as long as she could remember. Both growths were excised.

The papillary angioma does not amount to much in itself, but in a situation like the one here portrayed, it is apt to undergo sufficient irritation to cause malignant degeneration in time. The safer plan, therefore, is to remove it before such a contingency arises, particularly in view of its situation at the point of transitional epithelium. Whether Cohnheim's theory of the cause of cancer be accepted or rejected in full, it seems fairly certain that tissues in the line of transition from one kind of cells to another is less resistant than tissue not so placed.

CASE XII.—K., male, *æ*t. fifty. Admitted to the New York Polyclinic Hospital, April 12th, 1910, for removal of a growth on the lower lip (Fig. 12). This was removed, and upon microscopic examination proved to be early epithelioma.

This man was an inveterate smoker, and presumably, in line with the view of 'smoker's cancer,' the irritation of the pipe or cigar gave rise to the tissue change which eventuated in malignancy. Some, many in fact, of the most distressing cases of cancer of the jaw and glands of the neck give the history of incessant smoking. Patients should be urged not to hold the pipe or cigar always on the same side of the mouth, if they must smoke at all, but to shift its position, and to avoid burning the lips or tongue.

CASE XIII.—F., female, *æ*t. fifty-four, consulted me for advice concerning the condition shown in Fig. 13. This appeared three years before, beginning as a small pimple on the upper lip, just below the nose. It grew slowly, finally ulcerating, bleeding, and painful at times. This was excised and the area fulgurated. Pathological examination showed it to be epithelioma.

CASE XIV.—F., female, *æ*t. thirty. The condition for which she consulted me was a small growth on the side of the tongue, as shown in Fig. 14. This was excised, with a free margin of healthy tissue. This proved to be papilloma, on microscopic examination, but it was removed because of the constant irritation and to prevent possible and quite probable malignant degeneration.

In this case the trouble started from a spot of irritation from a defective tooth. The dentist, therefore, can play a very important rôle in the prevention of cancer, and patients should be warned of the dangers arising from neglect to consult a capable and conscientious dentist. Jagged and irregular teeth, badly fitting crown- and bridge-work, poorly adjusted plates, are prolific sources of irritation, and doubtless many cases of cancer of the tongue, lips, and buccal mucous membrane are initiated in this way. Furthermore, it is not determined just what part intestinal toxemia may play in the causation of cancer, and the constant swallowing of effete and germ-laden material which accumulates within and around decayed teeth may have more far-reaching ill effects than can at present be estimated.

CASE XV.—R., male, *æ*t. forty-one when he first consulted me, February 12th, 1907, concerning a small tumor at the tip of the tongue, as shown in Fig. 15. The small nodule, together with a wedge-shaped section of healthy tissue surrounding, 1 in. long, with the apex toward the base of the tongue, was removed from the median line of the tongue. Careful microscopic study of the nodule itself, and of sections taken along the healthy tissue, was made. The nodule proved to be epithelioma. No cancer cells were found in the re-



Fig. 10.



Fig. 11.

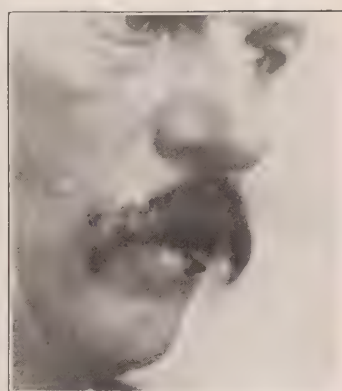


Fig. 12.



Fig. 13.

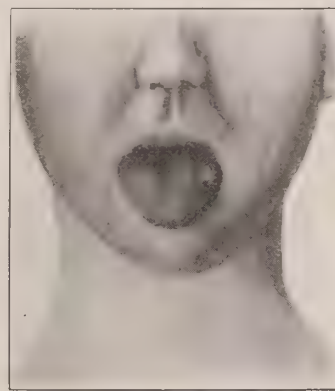


Fig. 14.

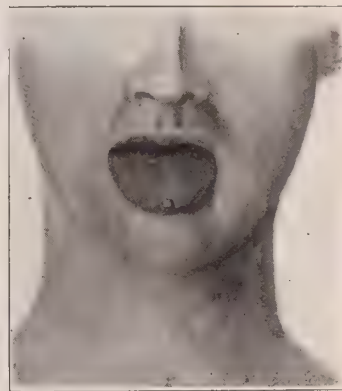


Fig. 15.



Fig. 16.



Fig. 17.



Fig. 18.

mainder of the tissue, until near the very apex of the wedge was reached. There a nest of suspicious cells was found. A day later a longer angle was made by the removal of another small section at the apex of the wedge-shaped incision. Presumably all malignant cells were removed at the second operation, as there has been no sign of recurrence.

CASE XVI.—M., female, *æ.t.* seventeen. Admitted to the New York Skin and Cancer Hospital, November 10th, 1908, for treatment for a swelling of the tongue, as shown in Fig. 16. The tongue presented a growth in the right side, middle, about the size of a hazel-nut. This was hard, smooth, and freely movable. It had started as a very small nodule two years before. It gave no discomfort except interference with speech. The growth was excised, and upon microscopic examination proved to be enchondroma.

Defective teeth, in this case, as in many others, may have had some effect in producing this tissue change which resulted in this neoplasm. The neoplasm of itself was not malignant, but by continued growth would have become so by virtue of its interference with speech, deglutition, and perhaps eventually with breathing. It might also have caused cancerous degeneration.

CASE XVII.—W., female, *æ.t.* thirty-three, consulted me March 8th, 1915, regarding a tumor in the breast. Upon physical examination the large pigmented mole, shown in Fig. 17, was noted upon the right forearm. It was slightly elevated. It was excised, and the pathological report made by Dr. F. M. Jeffries was "pigmented mole, possibly early malignancy."

This mole had been present for years, but had latterly begun to thicken and become elevated—a signal of danger, not wisely overlooked.

CASE XVIII.—M., female, *æ.t.* thirty-five. Consulted me, April 7th, 1915, regarding small growths, one on each wrist, as shown in the picture of the right (Fig. 18). These had existed since birth, each being at that time about the size of a pinhead. About three years ago the one on the right wrist began to increase in size, growing slowly, until it became as large as a silver quarter. When she consulted me this was melanotic in character, with scab formation, and bled easily. The growths were excised. The pathological report was as follows: "Growth from left wrist shows scattered nævus cell nests in derma. A moderate amount of pigment present. The growth from the right wrist shows areas of cells of the nævus type, also areas of large cells mixed with pigmented cells. These show irregular growth and have caused thinning of the epidermis and almost ulceration. Melanosarcoma." Dr. D. Stewart Dodge Jessup made the examination.

Melanotic moles, particularly when elevated, and more especially if subjected to irritation, are apt sooner or later to undergo sarcomatous degeneration, and should, therefore, be removed. If this is not permitted, the patient should be kept under careful observation.

CASE XIX.—G., male, *æ.t.* forty-six, consulted me February 12th, 1912. The patient, a physician, after years of *x*-ray work, developed epithelioma on the thumb, index finger, and little finger, involving the base of the ring finger (Fig. 19). The third and fourth fingers were amputated and the wound fulgurated. The small growths on the thumb and index finger disappeared under fulguration.

It is now generally conceded that *x*-rays may initiate a malignant process, when employed for long periods of time, and unless the operator protects himself with great care from burns.

CASE XX.—P., male, *æ.t.* sixty-five. Admitted to the New York Skin and Cancer Hospital, June 22nd, 1912, for treatment for the condition of the hand



shown in Fig. 20. This growth was first noticed three months before, following a severe burn. It was excised. Pathological report confirmed the clinical diagnosis of epithelioma.

Warts such as this may exist for many years without giving trouble, and may then go on to malignant degeneration. This is particularly apt to occur in old people whose skin shows a tendency to the formation of senile keratoses. Malignant neoplasms developing upon these keratoses may go on to metastasize in other parts of the body. So-called senile warts, if they show

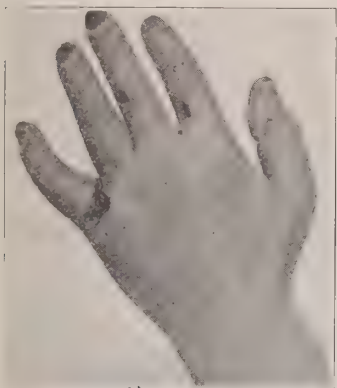


Fig. 19.



Fig. 20.

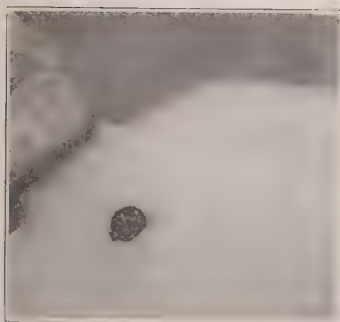


Fig. 21.

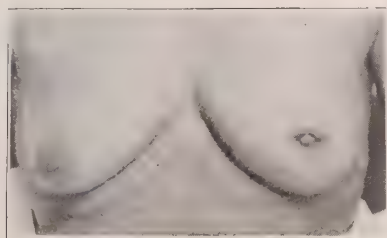


Fig. 22.

any tendency to undergo change, should be removed, and in any event kept under observation.

CASE XXI.—R., male, *æt.* seventy-four. Admitted to the New York Skin and Cancer Hospital, July 17th, 1911. Two years before, a small pimple appeared over the right breast, an inch above the nipple. It grew rapidly until it became the size of a walnut. Six months before admission ulceration took place. No treatment had been received previous to admission, at which time the condition was as shown in Fig. 21. The growth, with a margin of healthy tissue, was excised. The pathological report showed sarcoma of the mixed-cell type. There has been no recurrence to date.

CASE XXII.—L., female, *æt.* fifty-two, consulted me in March, 1915, on account of a tumor in the left breast. A very small tumor, perceptible only upon careful palpation, was found, but the nipple showed beginning retraction, as

may be seen in Fig. 22. The tumor was removed by conservative operation. Early carcinoma.

In this case, unlike many cases of cancer of the breast, the so-called classical sign, retraction of the nipple, appeared at a very early stage of the development of the neoplasm.

CASE XXIII.—K., male, *æt.* thirty-six. Admitted to the New York Skin and Cancer Hospital, April 17, 1915. Examination showed a growth, which upon microscopic examination proved to be medullary carcinoma, of the umbilicus, with secondary nodules in the skin in the neighborhood. The growth appeared



Fig. 23.



Fig. 24.



Fig. 25.

at the umbilicus two years before, developing into an ulcer which discharged freely. This was excised and the area skin-grafted. From this carcinoma in the navel the man has developed cancer of the liver, from which he will eventually die. It was human, however, to remove the discharging growth from the surface of his body, and relieve his mind of this constant source of worry and discomfort, making him as comfortable as possible.

CASE XXIV.—H., female, *æt.* fifty-four, consulted me November 10th, 1909, when she presented the large lipoma shown in Fig. 24. This was removed, and there has been no trouble since.

The lipoma was itself innocuous, but because of the size and the pressure and irritation caused by the friction of chairs, car seats, etc., it was in line for degeneration of the surface, and subsequent breaking down. Sometimes lipomata, in the course of development, in trying to push out of their capsules, may give rise to considerable pain. In any event it is the part of safety to remove them.

CASE XXV.—M., male., *æt.* twenty-seven. Admitted to the New York Polyclinic Hospital, March 8th, 1911, with the condition of the right leg shown in Fig. 25. This began as eczema, ulcerating, and extending as shown in the picture. In one place there was a spot that was suggestive of malignant degeneration. Under treatment with zinc oxide the whole area cleared up completely.

A case like this should be kept under surveillance, despite the fact that it cleared up under non-surgical treatment. In this locality, with the chains of lymphatics near by to carry infection upward and throughout the body, very extensive carcinoma may develop upon the base of an eczematous ulcer. I have seen a number of cases of this character.

Cases such as those reported above may serve as useful texts upon which to base important lessons concerning the prevention of cancer. For this reason they are cited. Inasmuch as the essential cause of the disease is unknown, any efforts aimed at prevention must of necessity be directed toward the elimination of factors which render the body, as a whole or in localized areas, less resistant to the initiation and development of a malignant process. These factors, in many instances, concern the most ordinary affairs of life, from pipe stems to corset steels, from suspender buckles to hat bands, and from these to the more specialized and complex matters, from x-ray apparatus to 'human plumbing.' In no single instance may it be affirmed with absolute assurance that one or more of these factors actually did inaugurate the cancer in a given case, but the weight of evidence is certainly heavily in favor of this contingency. The motto, 'safety first,' is nowhere more obligatory than in the campaign against cancer. Wherever there is presumptive reason for believing that a given factor plays a causative rôle in cancer production, no pains should be spared in the elimination of this, whatever it may be.

It is important, therefore, that patients be taught the danger of neglecting any of the factors which, from repeated observation, clinicians are now convinced help to induce cancer. It is important, too, that this be done without the inculcation of unnecessary fear and alarm. There is always danger of emphasizing one point, at the expense of failure to direct attention to another. We are apt, for example, to lay stress upon the matter of chronic irritation, about which so much has been said and written, and concerning which so much experimental work has been carried on, to the exclusion of other matters which may prove to be of equal importance. It may be proved, for example, that the body as a whole may, in



consequence of general lowered resistance, furnish favorable soil not only for the initiation of a primary malignant neoplasm, but of secondary or metastatic growths in one or more parts. General lowered resistance may, therefore, be no less important than localized lowered resistance. Defective teeth, to illustrate, may give rise to localized lowering of tissue resistance, in the mouth, on the tongue, on the lips, by constant irritation of the parts. We have cited instances in which this seemed to be the case. We cannot say, however, how potent these defective teeth may be in inaugurating a generally impaired state of the body which renders it less resistant to cancer as well as to many other diseases.

The public should be taught, therefore, that it is the part of safety to look after both internal and external hygiene,—so to order and regulate life that not only the body as a whole, but each individual part of it, may functionate in a manner most conducive to health. In doing this it is obligatory that warts, moles, nævi, scars, 'sores,' 'pimples,' and the many seemingly inconsequent localized tissue abnormalities, be given due consideration when they are so situated as to render them liable to repeated trauma or injury or to chronic irritation. This is applicable with reference to the infant as well as to the aged, for no age is exempt from one manifestation or another of this indefinable something which we call tissue predisposition, from precancerous conditions, and from cancer.

Rational attention by physicians and laymen to these seemingly inconsequent conditions would undoubtedly tend to lessen the proportion of cases of cancer, and certainly of irremovable, inoperable, and hence fatal, cancer. To keep a watchful overlook of all patients with reference to these conditions is the duty of every physician and surgeon.

## THE ROENTGEN INVESTIGATION OF CARCINOMA OF THE ALIMENTARY TRACT.

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In the diagnosis of carcinoma of the alimentary tract, the roentgen finding of prime importance is a filling-defect. Practically, the alimentary tract is roentgenologically invisible, until we place within it some opaque substance or some gas which renders the shadow of the digestive tube darker or lighter than that of the surrounding tissues. Inflation of the stomach and colon still occasionally serves a useful purpose, but for the most part, opaque media are nowadays employed in alimentary studies by means of the roentgen ray.

At some time or other after an opaque meal, it is possible to study every part of the alimentary tract, providing one has the necessary appliances. The enema serves especially to visualize the colon, although occasionally the last few feet of small bowel may also be studied in this manner when insufficiency of the ileocolic valve permits the opaque clysma to pass upward into the ileum.

Naturally it is only the *lumen* of the esophagus, stomach or bowel which appears roentgenologically. The opaque meal or enema constitutes a mould, so to speak, of the cavity of the digestive tube,—a living, acting mould, susceptible of study from many angles. If the stomach or bowel has not been emptied preceding the introduction of the opaque medium, the residues of translucent food material in the digestive tube occupy a portion of the space which would otherwise be visualized by the opaque medium and the luminal shadow will be incomplete or defective. Such an imperfect shadow, when seen, is said to present a *filling-defect*. In the same way, a tumor springing from the wall of the digestive tube will displace a certain amount of the opaque medium and likewise cause a filling-defect.

As above noted, filling-defects constitute the chief roentgen sign of neoplasm. The character and location of this filling-defect usually permit one to draw definite conclusions as to the nature of the tumor, although it is obvious that there will be a few cases of rare benign lesions, such as fibromata, lipomata, papillomata and myomata, and possibly also cases of luetic and tuberculous tumors, where from the roentgen findings alone one will not be able to dif-

ferentiate from carcinoma. It is further evident that in certain cases it will be impossible, from the roentgen standpoint alone, to differentiate between a benign inflammatory mass occurring in connection with ulceration and a malignant degeneration. Yet when one recalls that the surgeon himself at operation often finds it impossible, from the gross specimen, to differentiate between a benign and a malignant lesion, it can hardly be expected that in such cases a pre-operative differentiation can be made from the roentgen findings. Yet, in occasional striking cases, the roentgen findings will be decisive where from macroscopic study a differentiation cannot be made.

*Obstruction* is another important roentgen sign noted in a large percentage of alimentary tract malignancies, with a certain grade of *dilatation* proximal to the obstruction. This finding is early except in carcinoma of the body of the stomach where there may be no signs of obstruction even in very late stages of the disease. In fact, it is now recognized that in very early carcinoma at either orifice of the stomach, there may be an abnormal patency of the opening rather than a stenosis, the infiltration of the sphincter due to the malignant disease hindering its action and preventing its normal closure during the early stages of disease, although obstruction supervenes later when the progressive lesion mechanically closes the cardia or pylorus.

Inasmuch as the diagnosis is largely based upon the demonstration of a filling-defect, it is of first importance that a thorough emptying of the alimentary tube be secured prior to examination. The esophagus may be studied without any special preparation. Except in the worst cases of gastrectasis, the stomach will be found empty after a night's abstinence from food and drink. No hard and fast rule can be set regarding preparation for study of the colon, inasmuch as the examination is often called for by symptoms of urgency. Enemata are preferable to salines or castor-oil in preparing the bowel for roentgen studies.

*The Esophagus.*—Carcinoma of the esophagus is not an uncommon disease, though there is considerable variation in the frequency with which it is encountered in the various clinics. Involving most often the middle and lower thirds, it is at first confined to the mucous lining, with the comparatively early development of ulceration. Obstruction is not always an early occurrence, as shown by the statistics of Richard Cabot, for in his series the cases of esophageal carcinoma furnished a large proportion of erroneous diagnoses, or failures to diagnose, owing to the absence of the symptom of dysphagia; yet dysphagia is the earliest clinical symptom, and it is usually the symptom which brings the patient to us.

Roentgenologically, the earliest sign may be a spasmodic stricture rather than the obstruction one would expect from the organic



stenosis attending the carcinomatous lesion. The writer has found a number of cases of esophageal carcinoma in which the first signs of obstruction were due to a spasm set up at the level of the early malignant lesion or just above it, a considerable time before the infiltrating process had brought about actual narrowing of the lumen. This is especially true of those cases of carcinoma of the lesser curvature high up in the stomach involving the cardiac orifice. It often happens that these obstructions are at first considered spastic, because the administration of antispasmodics temporarily relieves the dysphagia. Occasionally an extra-esophageal malignant mass will be accompanied by a spasmodic obstruction in the esophagus. The writer has in mind particularly one case in which the esophageal obstruction was due to a carcinoma of the lesser curvature of the stomach, with extensive infiltration of the glands about the cardiac orifice, and some infiltration of the cardia; yet the site of the obstruction in the esophagus, as determined both by sounds and by the roentgen studies, was two or three inches higher than the infiltrated area, and it had all the ear-marks of a spastic hindrance.

Distension of the esophagus and hypertrophy of its walls usually occur above the carcinoma. The hypertrophy of the walls is not a matter of roentgen determination except as may be inferred from the vigor of the peristaltic contractions in the esophagus. The amount of dilatation of the tube is easily and accurately investigated by the introduction of an opaque mixture. On account of the rapid progression of the disease there is not time for the development of such enormous dilatation as one often sees in cardiospasm. In the latter disease the dilatation of the esophagus is sometimes so great that the patient has no difficulty in swallowing an ordinary meal and retaining it for hours above the obstruction; in carcinoma, however, dilatation, though it occurs to some degree, is usually not marked. In fact, when ulceration is extensive in the later stages of the disease, the stricture may be somewhat relieved, and the patient may show some temporary subjective improvement.

In mild grades of esophageal spasm, there is an arrest of the capsule or other opaque test material, even liquids, at the level of the obstruction. After a period of hesitation, during which one sees the movements of ascent and descent corresponding to peristaltic and antiperistaltic waves, suddenly the capsule or barium mass may pass into the stomach. In mild cases of spasm, one sometimes sees a large bolus of barium mixture representing as much as half a cupful pass from the cardiac orifice into the stomach in a few moments, after a prolonged stay in the esophagus due to the spasm. In the very marked cases of spasm, this will not occur until after the administration of antispasmodics. In true cardiospasm, the level of the obstruction is seen to be an inch or two below the dia-

phragm and there often occurs a marked dilatation of the sub-diaphragmatic portion of the esophagus (Fig. 7). The outline of the lower end of the esophageal shadow is funnel-shaped and regular, although during the movements of respiration and esophageal peristalsis, it is easy to ascertain that the esophageal walls are elastic. The administration of an antispasmodic is of relative value only. It does not give absolute security.

In scirrhus carcinoma, the obstructed barium mixture will cause the appearance of a smooth-edged, funnel-shaped mass above the stenosis, although occasionally one encounters a case where a cicatricial stenosis closely resembles the irregularly dentated lower border of the esophageal shadow in carcinoma. In many cases, however, roentgenograms will be similar to those of benign strictures, from which they must be differentiated by the history.

Medullary carcinoma of the esophagus causes the barium shadow to present a different appearance. Instead of the funnel-shaped shadow, with the point downward, the lower edge of the shadow will be more irregular, more dentated and more lacunar. Its irregular, indented contours are characteristic for the medullary form of carcinoma (Figs. 4 and 5). The discovery of large mediastinal glands in the neighborhood of the stenosis will still further suggest the malignant nature of the obstruction.

In a case of moderate dilatation and stenosis due to carcinoma, there is an appearance at the bottom of the shadow as if the stream were checked or even broken in order to facilitate its passage through a tiny irregular-shaped drain. If the dilatation is marked, then the sacculated esophagus, by its weight, overhangs the area of stricture, and hides the irregularity of the shadow characteristic of malignancy. In such cases, one will see the more or less rounded lower border of the diverticulum, past which trickles downward a thin irregular stream of barium (Fig. 2a). In a case of true diverticulum of the esophagus, the finger-like masses will have the same size above and below the point of stricture (Fig. 2b). By turning the patient obliquely, the observer will, in one position or another, manage to see definitely that the retention occurs in an extra-luminal sac.

Certain mediastinal tumors, especially malignancies occurring in the mediastinum, may closely resemble esophageal carcinoma. Aneurysm of the aorta and cases of aortitis in which there is a peri-aortic reaction with adhesions, may also give roentgen findings simulating those of carcinoma of the esophagus. It is important that every chest should be screened before the administration of barium. One will in this manner occasionally discover a large mass of calcareous mediastinal glands which would be extremely confusing if not recognized before the administration of the opaque substances (Fig. 3).

As the opaque medium in the study of the esophagus, one may employ one of the following:—

- (a) Mixture of barium sulphate and water, 15 grm. to the ounce.
- (b) Cachet or wafer in which one or two grams of barium sulphate powder are enfolded.

(c) Capsules of varying size. These are especially valuable in determining the exact dimensions of an organic stenosis. The capsule may block a narrowed opening, so that liquids swallowed later will be delayed in the esophagus.

(d) A suspension of barium sulphate in buttermilk, preferably one of the Oriental clotted milks.

(e) A mixture of barium sulphate in glycerine. The exact quantity of the powder employed is of no great consequence, inasmuch as large quantities of the mixture are rarely required.

(f) The writer finds most useful of all, in these cases, a mixture of barium sulphate in shredded pineapple or in some other fruit preparation such as apple butter, prune marmalade, or ordinary jelly. The first and the last are most often employed.

A special technique has lately been suggested by Crump and Stewart of New York City, involving swallowing into the esophagus several feet of sausage skin, the lower end of the tube being carefully tied. When the passage of the lower end of the tube through the stenosed area has been assured, the tube is filled with an opaque mixture poured through a funnel into the upper end. In this manner, one secures the complete outline of the filling-defect in the stenotic area, delineating not only the upper but also the lower border of the stricture. The information thus obtained is sometimes decisive and invaluable.

In the average case of supposed esophageal obstruction, the patient should first be examined in the erect position under the fluoroscope, watching the act of swallowing after the ingestion of a third of a glass of barium-water mixture (Fig. 1). The patient should then take the mixture above described in 'f,' after which he is again studied in the various positions fluoroscopically, and a stereoroentgenogram is made with the body turned in such direction that the rays enter the chest from behind between the spinal column and the left scapula, traversing the thorax obliquely so as to give a clear field of illumination between the cardiovascular shadow anteriorly and the spinal shadow posteriorly. The esophageal shadow will be found to occupy this clear space. The special technique of Crump will be indicated in doubtful or difficult cases.

*The Stomach.*—The cardinal roentgen sign of gastric carcinoma is a filling-defect (Figs. 11 and 12). When an opaque meal is introduced into the empty, normal stomach, the lumen of the stomach presents a characteristic complete shadow, subject to certain



normal indentations (Figs. 9 and 10). These normal indentations are as follows:—

(a) The splenic notch (Fig. 9d) usually present at the upper border of the greater curvature, due to the pressure of the spleen against the greater curvature. One may judge thereby as to the size of the spleen.

(b) The changes in shape of the stomach shadow produced by the peristaltic waves (Fig. 9c) are varying but characteristic, and are easily recognized under the fluorescent screen or by a series of roentgenograms.

(c) The pyloric sulcus (Fig. 9a), the break between the shadow of the stomach and the shadow of the first portion of the duodenum (variously termed *bulbus duodeni*, *duodenal bulb*, *stomach cap*, *pileus ventriculi*), normally about one centimetre in width.

Excluding these normal indentations, any defect in the gastric shadow (Fig. 11) must be regarded as suspicious of malignancy and the identity of the defect must be determined. A carcinomatous filling-defect may be simulated by a spastic manifestation in the stomach (Fig. 36), the pressure upon the wall of the stomach by an extra-gastric tumor (Figs. 31 and 32), especially of the liver, transverse colon, spleen or pancreas, and sometimes by pressure of the gas-filled colon (Fig. 9).

The ragged appearance imparted to the upper part of the greater curvature by gas distension of the splenic flexure can easily be differentiated by manipulations under the fluorescent screen. It is less easy to differentiate between a retroperitoneal sarcoma and a pancreatic tumor, although it is characteristic of pancreatic tumors that the stomach empties quickly. Filling-defects caused by extra-gastric tumors are usually demonstrated by observing the progress of the peristaltic waves. Whenever the stomach wall is indurated, as in carcinoma, the peristaltic waves are lacking. Careful manipulation with the protected hand, and observations during respiratory movements and voluntary abdominal contractions, usually make possible the recognition of these extra-gastric tumors. The pseudo-filling-defects due to spasm are usually clean-cut and characteristic. Vigorous manipulations usually cause the spasm to relax, although in the worst cases the administration of atropine, sometimes for so long as twenty-four hours before the re-test, may be required to cause its disappearance.

Some authors hold that all tumors, including carcinoma, adenoma, myoma, sarcoma and indurated ulcers should be regarded as gastric carcinomata because they can only be differentiated one from the other by careful microscopic examination of the specimen after its removal. Perigastric adhesions sometimes cause indentations that may be mistaken for carcinoma. It is usually possible to differentiate these by manipulation of the stomach through the abdominal

wall. There are cases, particularly the early cases, where, from the roentgen examination alone, one may only say that there is a mass, without venturing an opinion as to whether it is due to ulceration with inflammatory reaction or to malignancy. One must also think of syphilitic and sarcomatous lesions, and the possibility of having to deal with a tuberculous mass. It must be admitted that syphilis does involve the stomach (Fig. 39), and that the gummatous or ulcerating tissue can cause scarring and shrinking. This is probably as far as can be gone in the positive diagnosis of syphilis of the stomach, at least from the roentgenologic standpoint. Tuohy calls attention to the fact that in the gastrointestinal tract there are well-known tendencies to syphilitic stenosis, for instance, in stricture of the rectum or in stenosis of the larynx. It is obvious that the diffuse shrinking process sometimes encountered, which results in hour-glass stomach, might, in some cases, easily prove to be due to syphilis.

Alterations in the size and position of the stomach and interference with the elasticity of the gastric walls are other evidences of carcinoma which may be determined roentgenologically. The carcinomatous stomach contracts, and as it contracts it rises up under the costal margins. This contraction of the stomach is usually accompanied by interference with the elasticity of the gastric walls, especially in cases of infiltrating scirrhus carcinoma. The position of the stomach is not materially altered, except in connection with the shrinking process which tends to pull it upward under the ribs.

A careful study of the gastric silhouette by means of the fluoroscope and a series of roentgenograms should permit a positive or negative opinion as to the presence of a filling-defect. The interpretation of this filling-defect may be very difficult and at times impossible, but in the majority of cases it will prove to be carcinomatous. The gross filling-defect produced by a tumor of the lower half of the stomach on the greater or lesser curvature is usually obvious, as shown in the accompanying illustrations. The characteristics are as follow:—

1. Permanence. The filling-defect is of the same size, in the same location, and of the same identical shape and outline at the various observations.

2. The filling-defect usually coincides with a point of tenderness on pressure, or, if the entire epigastrium be tender, with a point of most marked localized pressure-pain. The absence of a pain-point does not at all negative the seriousness of a filling-defect.

3. Screen examination as well as serial plate examination will show that the peristaltic waves fade out as they reach the region of the filling-defect; and, provided it is not too near the pylorus, the waves reappear beyond the defect, proceeding to the pylorus.

An inflammatory mass associated with ulcer may give rise to this same phenomenon.

4. When the lesion is near the pylorus, even though not directly producing stenosis, antiperistaltic waves may be observed. These are seldom recognized on plate examination, but if repeated fluoroscopic observations are made, at some time or other, in every case of organic pyloric obstruction, antiperistaltic waves are likely to be observed; when seen they are pathognomonic of an organic lesion. Here again the evidence does not necessarily speak for malignancy, but with a filling-defect antiperistalsis is exceedingly suggestive of malignancy. Antiperistaltic waves are best seen an hour or two after the ingestion of the meal.

5. Unless there exists actual mechanical obstruction due to narrowing of the lumen of the stomach, there is usually early clearance of the stomach contents in a manner characteristic of achylia. This is a point in the differential diagnosis between benign and malignant hour-glass stomach. In ulcer cases the emptying time of the stomach is usually normal or even prolonged. Even in pyloric carcinoma there may be a pyloric insufficiency, the action of the sphincter being hindered by the induration of the gastric walls before the extension of the tumor growth has produced actual stenosis. In such cases, even though a moderate grade of gastric acidity still exists, clearance of the stomach contents may take place with unusual rapidity. As soon as pyloric stenosis is produced, however, the symptoms are those of gastrectasis. The peristaltic waves are increased in depth, at times almost cutting the gastric shadow in two; the waves are increased in frequency, and begin higher up in the stomach; and, if one be fortunate, antiperistaltic waves may be recognized, especially after digital manipulation of the stomach through the abdominal wall, or after the patient has taken several gasping breaths.

The determination of the extent of a gastric tumor and the probability of adhesions to neighboring organs, as well as the identification of pain-points on pressure, can be accomplished satisfactorily only by palpation under the fluorescent screen. A wooden spoon of special design is very helpful in this manipulation, though, in the writer's opinion, it is practically safe to use the hand for this purpose, provided it is protected with a heavily-leaded glove. If there are evidences of fixation to neighboring organs, the probable extent of the tumor may be inferred.

In differentiating between benign cicatricial stenosis of the pylorus and stenosis due to malignancy, the writer has found it of special value to make the screen and plate examination with the patient lying on the right side, the tube behind the patient, and the screen or plate held vertically against the abdomen (Fig. 17). In this manner it is possible to bring out the finest detail of the pyloro-



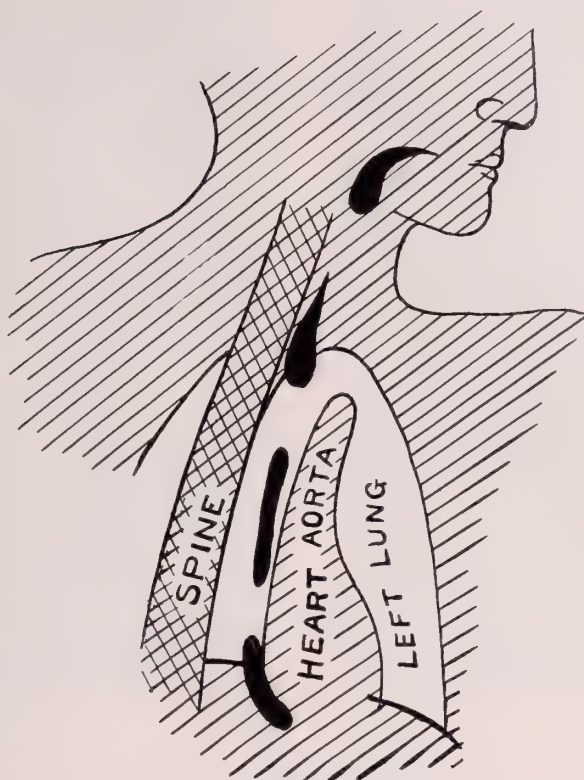


Fig. 1.

Fig. 1. A drawing after Holzknecht illustrating the appearance of a swallow of the barium meal at four different levels in the esophagus. By giving liquid food, the entire esophagus may be momentarily visualized.

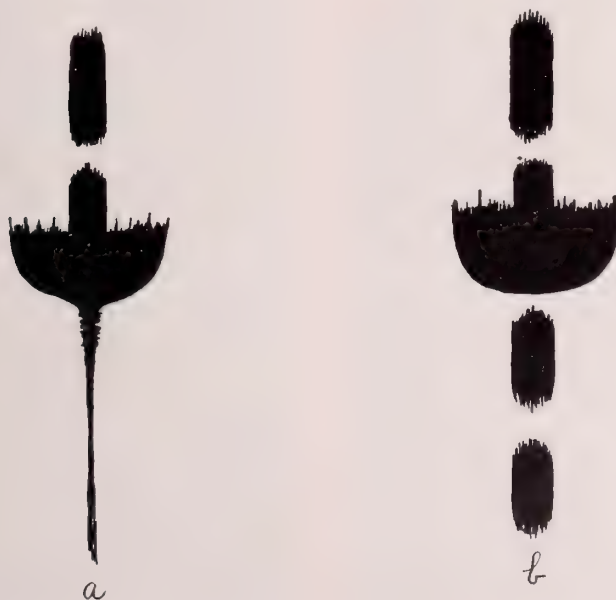


Fig. 2.

Fig. 2. Two drawings after Holzknecht comparing the appearance of the esophagus in diverticulum associated with malignancy (a) and in a true diverticulum (b).



Fig. 3.

Fig. 3. A mass of calcareous mediastinal glands discovered by fluoroscopic examination previous to the ingestion of opaque materials.

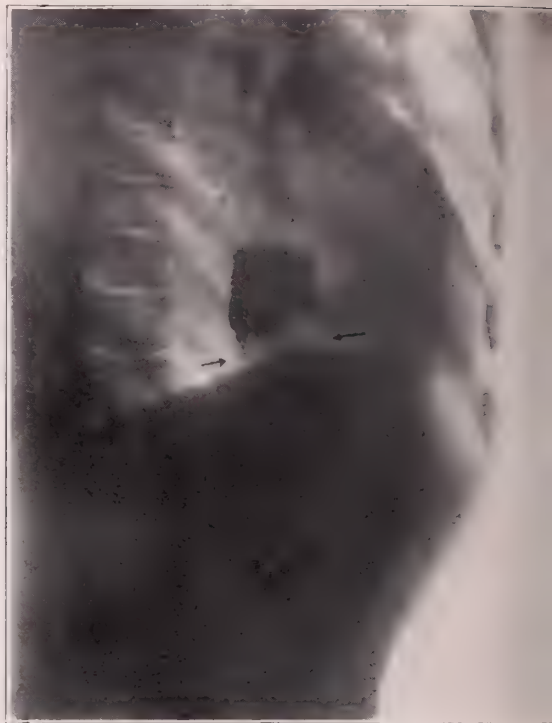


Fig. 4.

Fig. 4. Typical appearance of the esophageal residue above a carcinomatous stricture.



Fig. 5.

Fig. 5. Carcinoma of the esophagus in a hunchback. Note the irregularity of the lower border of the barium shadow as shown at the arrow.



Fig. 6.

Fig. 6. Carcinomatous obstruction of the esophagus attending a malignancy of the lesser curvature of the stomach.

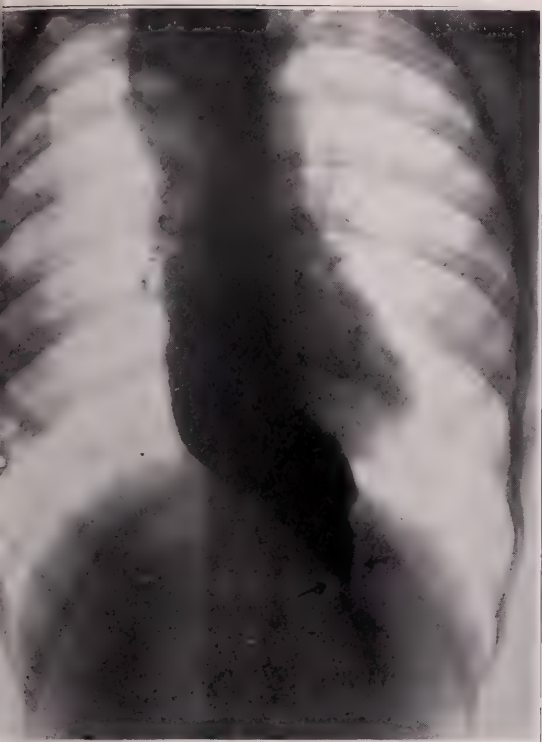


Fig. 7.



Fig. 8.

Fig. 7. For comparison this case of cardiospasm is shown. Note particularly the relatively greater distension of the esophagus and the characteristic funnel-shaped shadow ending at the cardiac orifice.

Fig. 8. A case of esophageal obstruction in which the barium residue in the esophagus shows irregular contours. Marked traction of the esophagus toward the left by an ancient tuberculous process.



Fig. 9.

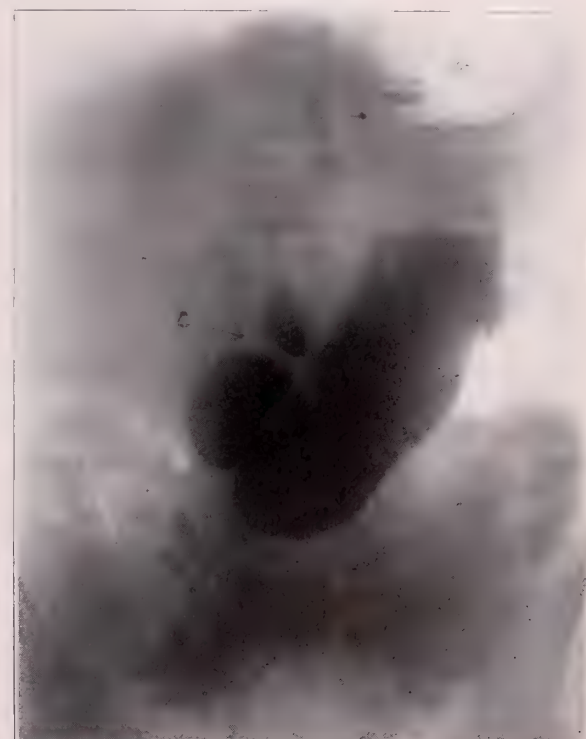


Fig. 10.

Fig. 9. Roentgenogram of a normal stomach, patient prone. a, pylorus; b, duodenal bulb; c, indentations due to peristaltic waves; d, splenic notch exaggerated in this case by gas distension of the splenic flexure.

Fig. 10. Roentgenogram of a normal stomach, patient standing. a, magen-blase; b, level of fluid in the stomach; c, pylorus.





Fig. 11.

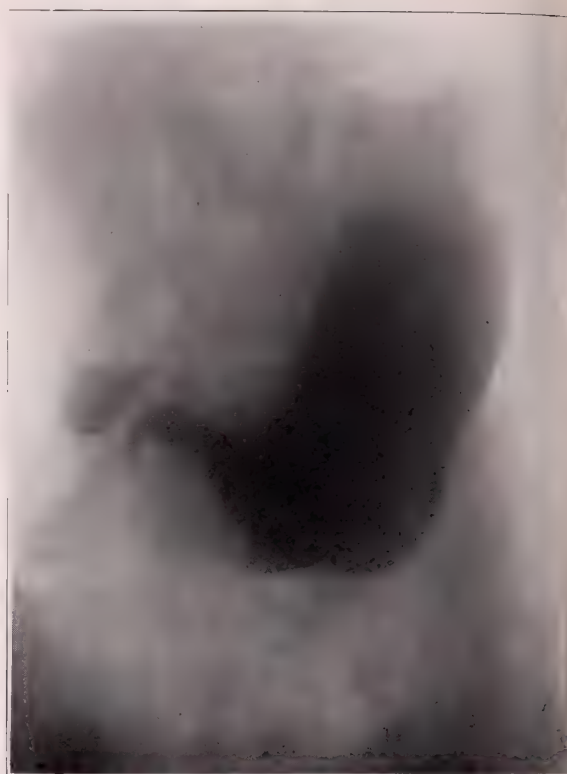


Fig. 12.

Fig. 11. A semi-diagrammatic roentgenogram illustrating the filling-defect in a carcinoma of the stomach. See Fig. 12.

Fig. 12. The same roentgenogram shown in Fig. 11 without the explanatory markings.



Fig. 13.

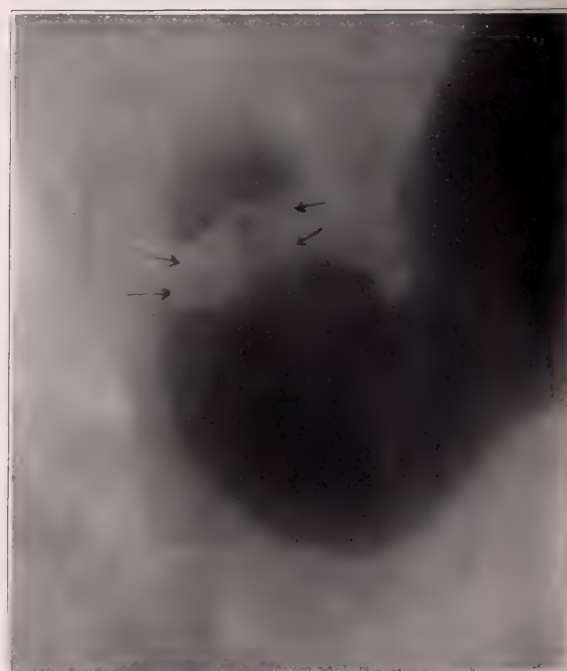


Fig. 14.

Fig. 13. Small annular filling-defect at the pylorus, characteristic of early carcinoma.

Fig. 14. Small annular filling-defect at the pylorus, characteristic of early carcinoma. Note that the pyloric portion of the stomach ends in a narrow finger-like process reaching out to the normal duodenal bulb. The sulcus between the pyloric end of the stomach and the bulb is much wider than normal.

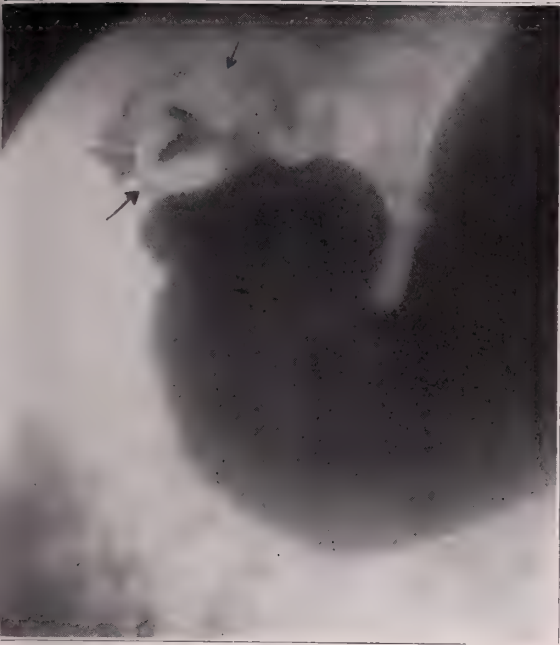


Fig. 15.



Fig. 16.

Fig. 15. Fairly early medullary carcinoma at the pylorus.

Fig. 16. Very early carcinoma of the pylorus. All the roentgen findings were those of a cicatricial stenosis at the pylorus. The tumor was not larger than the end of one's finger. The duodenal bulb does not show in this case as the obstruction was almost complete.

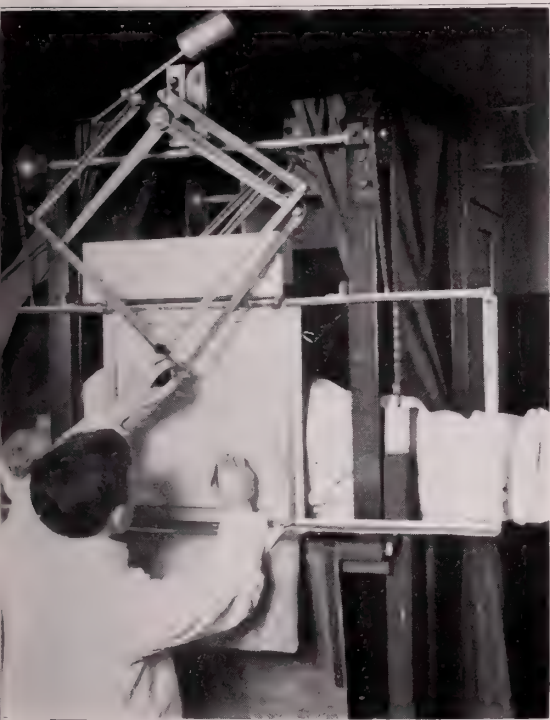


Fig. 17.



Fig. 18.

Fig. 17. Right lateral position useful in studying early lesions at the pylorus. The patient lies upon the right side facing the screen, which is held vertically in front of him. The rays penetrate from behind. This position favors the study of the pyloric region as illustrated in the next three roentgenograms.

Fig. 18. Roentgenogram of the stomach made in the position just illustrated in Fig. 17. Note that the level of the fluid in the stomach is transverse, parallel to the spine. The arrow points to a very small defect on the lesser curvature just proximal to the pylorus.



Fig. 19.

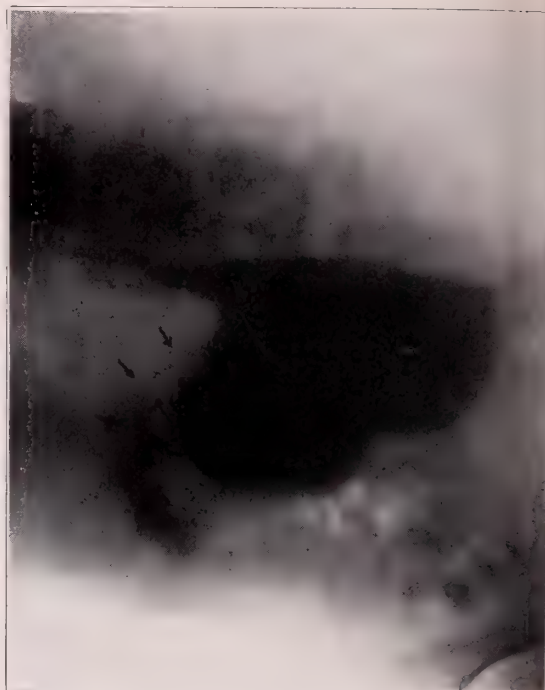


Fig. 20.

Fig. 19. A similar case. See Fig. 17. The arrow points out the filling-defect in the stomach just proximal to the pylorus.

Fig. 20. Roentgenogram made in the right lateral position described in Fig. 17, in a case of carcinoma of the pancreas, gall-bladder and liver, with adhesions to the pyloric end of the stomach narrowing the pyloric canal for three or four inches.



Fig. 21.

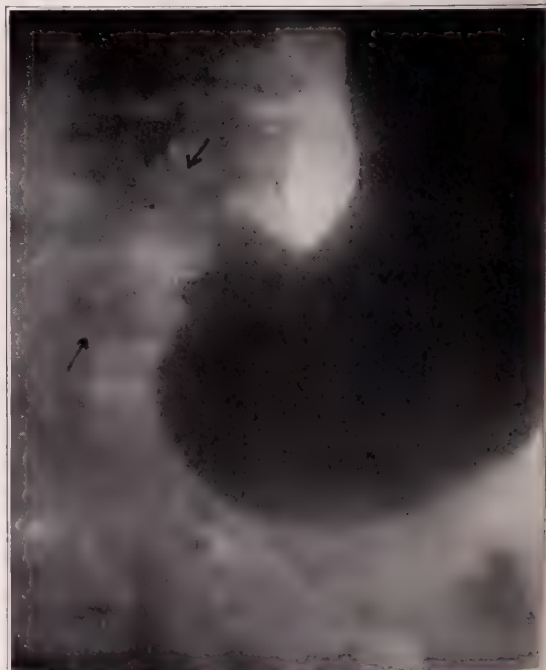


Fig. 22.

Fig. 21. Large annular filling defect involving the pars pylorica for an inch and a half. The duodenal side of the pyloric sulcus and the duodenal bulb are normal.

Fig. 22. A large annular carcinoma of the pylorus, completely obliterating the pyloric sulcus and duodenal bulb shadows. Marked gastrectasis.



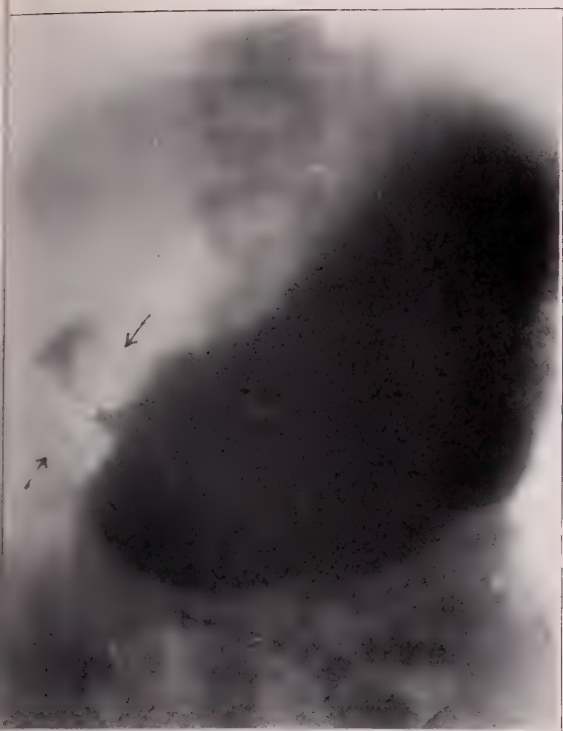


Fig. 23.



Fig. 24.

Fig. 23. Annular carcinoma of the pylorus, with marked gastric dilatation. The tumor was freely movable and the pyloric half of the stomach was resected.

Fig. 24. Enormous inoperable carcinoma involving the pyloric third of the stomach, reaching high up on the lesser curvature.



Fig. 25.



Fig. 26.

Fig. 25. Extensive medullary carcinoma involving the pyloric half of the stomach, especially the posterior wall. Inoperable. The colon contains food which had been given seventy-two hours previously. There was an obstruction in the descending colon due to adhesions from the carcinoma.

Fig. 26. Extensive malignant involvement of almost the entire stomach, particularly noticeable on the greater curvature in the pyloric half. The tumor reached as high as the cardiac orifice on the lesser curvature.



Fig. 27.

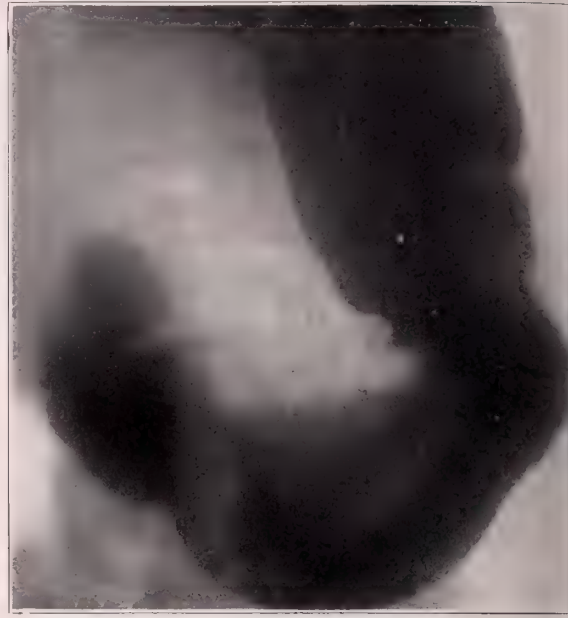


Fig. 28.

Fig. 27. Extensive cauliflower carcinoma involving particularly the greater curvature. The pyloric end of the stomach, pyloric sulcus and duodenal bulb were quite normal. No interference to entry or exit of food in the stomach.

Fig. 28. Extensive inoperable carcinoma involving more than half of the stomach, but without symptoms of gastrectasis. The pylorus is free from involvement.



Fig. 29.



Fig. 30.

Fig. 29. Rare carcinoma on the greater curvature.

Fig. 30. Extensive carcinoma of the stomach, with especially marked lesser curvature involvement. This is shown definitely by fluoroscopic study during which no peristaltic waves on the lesser curvature could be seen at any time.

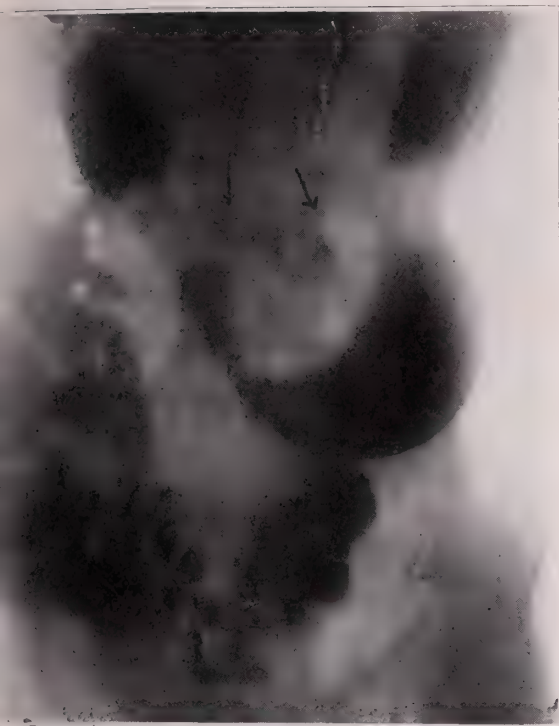


Fig. 31.



Fig. 32.

Fig. 31. A large filling-defect on the lesser curvature simulating carcinoma. In reality it is due to a retroperitoneal sarcoma making the defect by pressure on the stomach.

Fig. 32. A pancreatic tumor making pressure upon the lesser curvature, producing a filling-defect simulating carcinoma. Both in this case and in the case shown in Fig. 31, by altering the position of the patient, the contour of the filling-defect could be changed and peristaltic waves could be seen upon the lesser curvature.

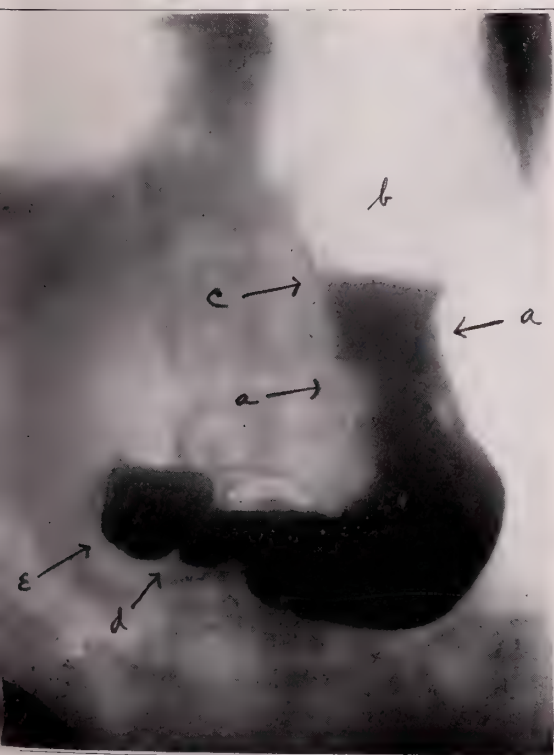


Fig. 33.



Fig. 34.

Fig. 33. Typical annular carcinoma involving the lesser curvature of the stomach. Very early stage, beginning hour-glass. a, filling-defect at the site of the carcinoma; b, magenblase or air-bubble in the fundus of the stomach above the fluid level; c; d, pylorus; e, duodenal bulb.

Fig. 34. True hour-glass stomach due to old penetrating ulcer. d, a, gas-bubble in the fundus above the fluid-level; b; c, defect partly spastic, mostly cicatricial; e, lower segment of the hour-glass stomach.





Fig. 35.

Fig. 35. Hour-glass stomach due to carcinoma developing on old lesser curvature ulcer.



Fig. 36.

Fig. 36. Pseudo-hour-glass stomach due to spastic indrawing high up on the greater curvature in a case of duodenal ulcer. This spastic indrawing is a manifestation of vagus irritation.



Fig. 37.

Fig. 37. Rare case of carcinoma high up on the greater curvature (at arrows) in a young man of twenty-nine. Inoperable case.



Fig. 38.

Fig. 38. Relatively early carcinoma of the pylorus which, by extensive adhesions along the lesser curvature, is no longer resectable.



Fig. 39.

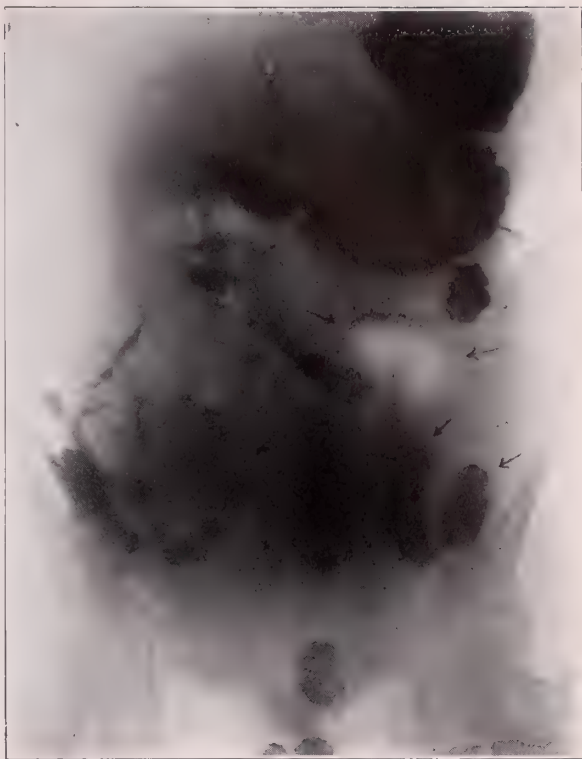


Fig. 40.

Fig. 39. Extensive syphilitic involvement of the lower two-thirds of the stomach simulating carcinoma.

Fig. 40. Carcinoma of the stomach with generalized peritoneal carcinomatosis. Note the islands of barium at arrows in the small bowel, indicative of peritoneal thickening.



Fig. 41.



Fig. 42.

Fig. 41. Ideal, enema-filled colon, patient prone. The figures indicate the relative frequency of carcinoma at the different areas marked.

Fig. 42. Enema-filled colon showing a very early tumor of the cecum.

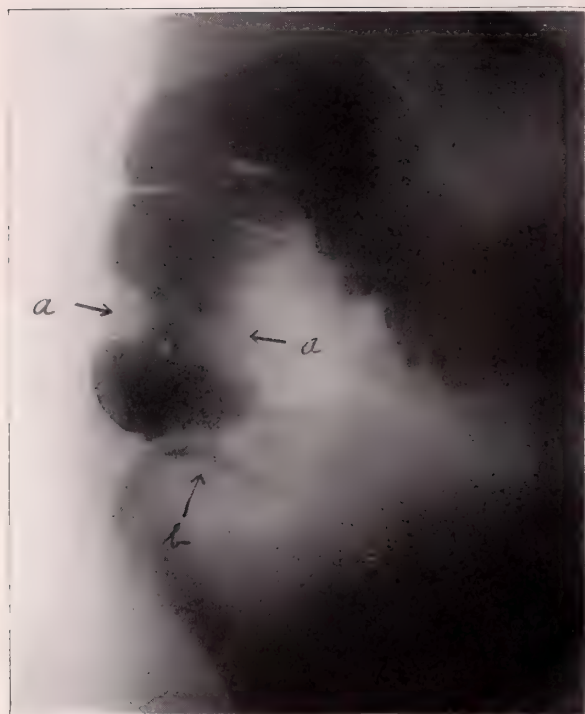


Fig. 43.

Fig. 43. Annular carcinoma. a, involving the ascending colon just above the ileocolic junction; b, the appendix.



Fig. 44.

Fig. 44. Filling-defect in the ascending colon caused by a recent emptying of the bowel by peristaltic ring contractions. This might confuse in the diagnosis of carcinoma.



Fig. 45.

Fig. 45. Enema-filled colon. The hiatus in the ascending colon just proximal to the hepatic flexure (arrows) is due to a recent peristaltic wave, and might lead to erroneous diagnosis of carcinoma.



Fig. 46.

Fig. 46. This roentgenogram made nine and one-half hours after the barium meal illustrates the banking up of material in the right half of the colon proximal to the tonic constriction ring of Cannon (at arrow). The anti-peristaltic waves originate at this ring.



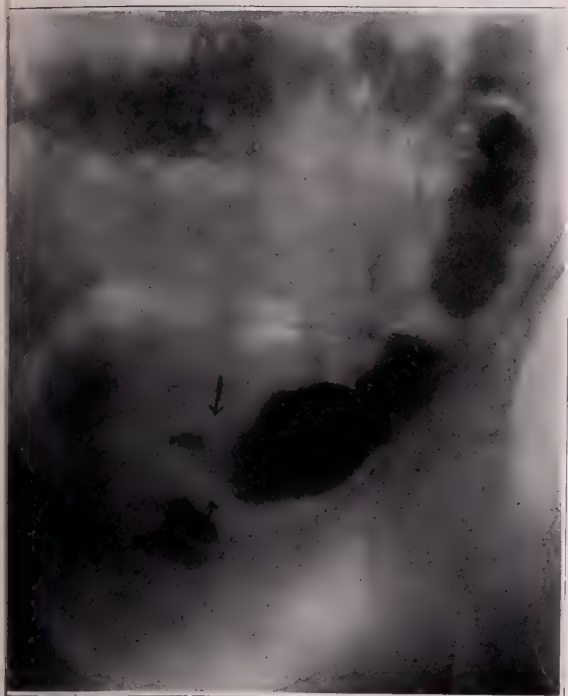


Fig. 47.

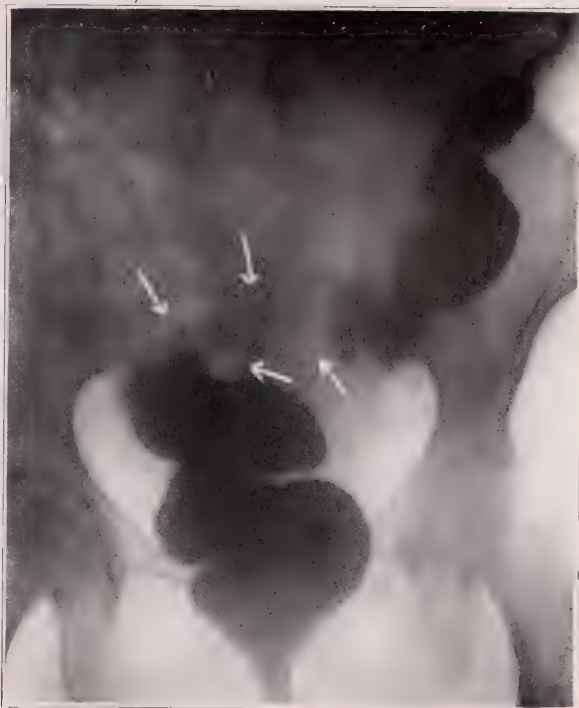


Fig. 48.

Fig. 47. Annular carcinoma of the pelvic colon seen one hundred hours after the barium meal. In this case the barium meal is banked up densely just proximal to the tumor. See Figs. 49 and 50.

Fig. 48. Annular carcinoma of the pelvic colon near the pelvirectal junction shown after the injection of an opaque enema. The distal arrows point to the irregular defect produced by the tumor. The proximal arrows point to an irregular filling of the colon due to extensive adhesions which involve the pelvic colon for several inches above the tumor.



Fig. 49.



Fig. 50.

Fig. 49. Diagrammatic roentgenogram in a case of carcinoma of the iliac colon (at arrows) immediately after the attempt to inject the colon with an opaque enema. Only a small amount of opaque enema passed the tumor. The enema was then evacuated and the barium meal given. Fig. 50 illustrates the appearance fifty hours after the ingestion of the barium meal.

Fig. 50. See Fig. 49. Roentgenogram fifty hours p. c. Note the great distension of the cecum, ascending and right half of the transverse colon. The contraction ring originated at the tumor, and is passing in the antiperistaltic direction, as indicated by the arrows.

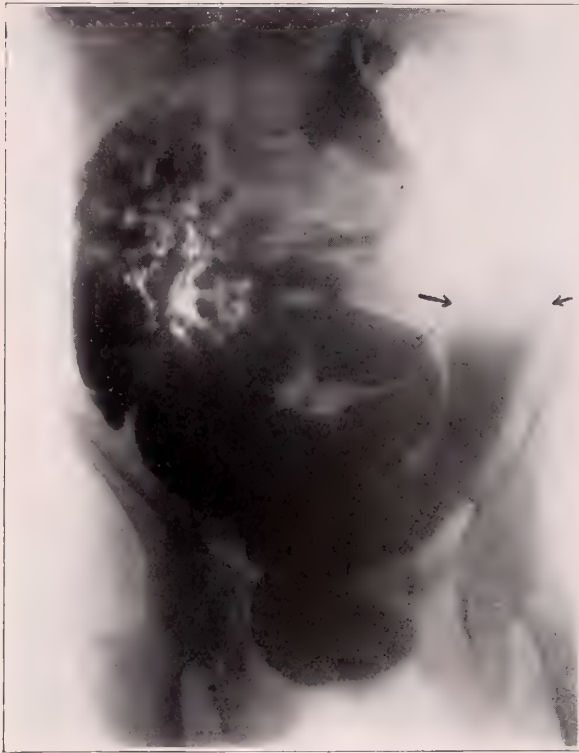


Fig. 51.

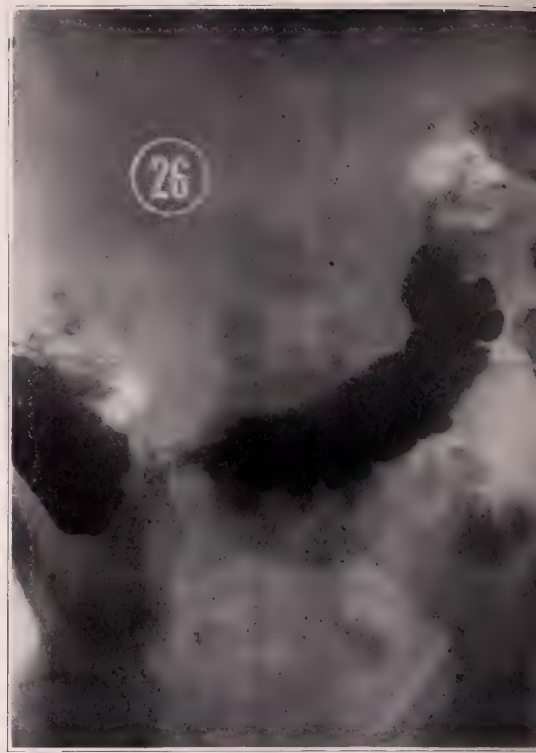


Fig. 52.

Fig. 51. Carcinoma of the descending colon at arrows. The colon distal to the tumor has been filled by enema. The other barium shadows represent the distribution of a barium meal given three hours previously.

Fig. 52. Roentgenogram made twenty-six hours after the barium meal in a case of tumor of the iliac colon. This shows the peristaltic unrest referred to by the writer in the text.



Fig. 53.



Fig. 54.

Fig. 53. Enema-filled colon in a case of colitis showing marked spastic narrowing of the iliac colon, especially where it crosses the iliac crest.

Fig. 54. Enema-filled colon in a case of pelvic colon adhesions, attending disease of the left uterine appendages. This case and the one shown in Fig. 53 might confuse in the diagnosis of carcinoma.



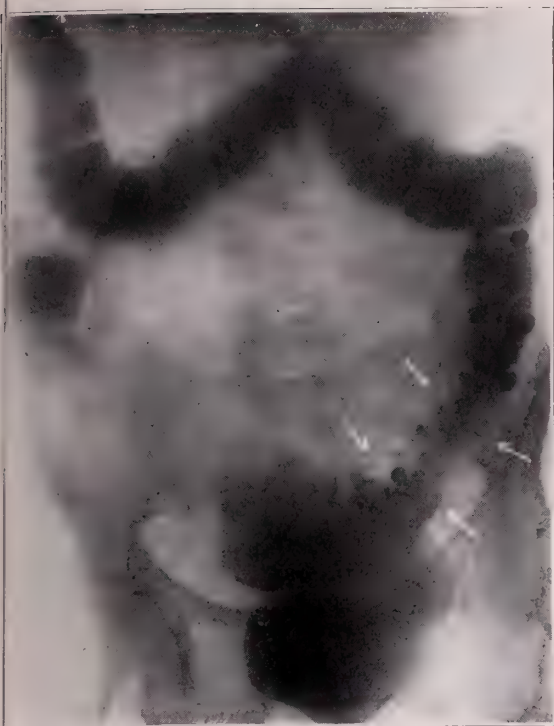


Fig. 55.

Fig. 55. A case of multiple diverticula of the colon with tumor (at arrows) in the left iliac fossa. Many of the diverticula can be seen by their denser rounded shadows. This condition is one of the most important to be differentiated from carcinoma. The diverticula contain barium which was eaten seventy-two hours previously. The colon was otherwise emptied, and is now injected by enema to show the relation of the diverticula to the colon.



Fig. 56.

Fig. 56. The barium-filled multiple diverticula in a case of multiple diverticula of the colon. The most of these diverticula are 'bunched' together in a short segment of bowel, favoring the development of tumor.



Fig. 57.



Fig. 58.

Fig. 57. Annular carcinoma of the rectum. Filling-defect due to the carcinoma shown at arrows.  
Fig. 58. Filling-defect in the rectal shadow (at arrows) due to extensive infiltration of tissues in a case of carcinoma in ano.





Fig. 59.

Fig. 59. Filling-defect in the rectal shadow due to extension of carcinoma from the uterus:



Fig. 60.

Fig. 60. Defect in the colon shadow due to extension of carcinoma of the prostate.

duodenal region (Figs. 18-20), often to better advantage than with the patient in the prone position, plate anterior.

Unless the pyloric carcinoma has supervened upon an old stenosing ulcer, it is likely that the stomach will not be greatly dilated in pyloric cancer, for the reason that the malignant process has advanced too rapidly to permit extensive dilatation. In benign ulcerous stenosis, on the other hand, including those cases where the ulcer has later degenerated into malignancy, the long duration of the process permits enormous increase in the size of the stomach.

In differentiating between hour-glass due to ulcer and that due to carcinoma there are several important points to be observed. Ulcer and carcinoma show differences in position, length and outline of the connecting canal between the upper and lower sac, as well as in the relative size of the two sacs. The ulcer or its scar is almost always located on the lesser curvature. The writer has seen but one case of ulcer high up on the greater curvature, in that instance penetrating into the spleen. The contraction associated with lesser curvature ulcer always occurs toward the lesser curvature, the seat of the shrivelling agent (Fig. 34). The connecting canal between the upper and the lower sac is located near the lesser curvature, and its outlines are usually nearly smooth and regular. There is often a slight projection of the stomach shadow at the site of the ulcer, owing to excavation attending the ulcer process. In ulcer only a limited portion of the greater curvature is pulled over toward the ulcer; the narrowness seldom affects the greater curvature for more than half an inch. In carcinoma, on the other hand, although the tumor usually starts on the lesser curvature, it produces there a light space (filling-defect), and the connecting channel between the upper and the lower sacs is located near the greater curvature (Fig. 30). When the malignant hour-glass is produced by an annular carcinoma, the lumen between the two sacs occupies a median position, lying in the axis of the stomach (Fig. 33). The length of the carcinomatous narrowing is greater than with ulcer, unless the ulcer has been attended by perigastric adhesions of considerable extent, or unless the ulceration has been multiple. The contour of the filling-defect is irregular and often indistinct, because the wall of the stomach is infiltrated. In ulcer the pathological findings occur opposite the site of the filling-defect, while in carcinoma there is resistance, often pain, and sometimes a palpable tumor corresponding with the filling-defect.

Differentiation between the hour-glass of ulcer and of carcinoma is helped by a consideration of the relative size of the two sacs. This relative size depends upon the relative position of the hour-glass constriction to the pylorus. The greater the constriction and the nearer the constriction to the pylorus, the greater will be the size of the upper sac. The size of the lower sac, which is of greatest

differential diagnostic importance, depends upon the permeability of the pylorus. A large lower sac exhibiting vigorous peristaltic waves speaks for ulcer, owing to the tendency of the pylorus to abnormal spastic contraction in the presence of ulcer; whereas in carcinoma the absence of free hydrochloric acid with resulting relaxation of the pylorus does not favor development of a large lower sac. Hence we may conclude that in hour-glass stomach, when the two sacs are markedly different in size, and especially when the lower sac is small, this fact speaks for carcinoma.

In a certain small class of cases where the clinical examination warrants a reasonable suspicion of malignancy, and where the roentgen findings are negative, it is wise to repeat the roentgen examination after four or five weeks. In a few cases the second examination has revealed evidences of malignancy not made out earlier; in the majority of cases the negative diagnosis will be strengthened. One of the most useful purposes of the roentgen examination in this class of cases, as well as in cases of inoperable malignancy, is to save the patient from an unnecessary exploratory operation.

In spite of the assurance which the roentgen method permits in stating a positive opinion as to the absence of malignant disease of the stomach, it is a striking observation that an early diagnosis of gastric carcinoma is rarely made. In fact, it is very rare that a case of truly early carcinoma is seen at operation. With malignant disease of the stomach, the morbid sensations produced by the affection are of such indefinite nature that the patient seeks medical advice only when it is too late for an early diagnosis, and even during the first examination, if the suspicion of a malignant tumor is forced upon the average examiner, he is seldom willing to express a positive opinion until the program of watchful waiting has been pursued too long for an early diagnosis. The majority of cases of gastric cancer do not submit themselves for examination in the early stages of the disease. In the writer's experience, as in that of White and Leonard, recently reported in the *Boston Medical and Surgical Journal*, most of the patients examined for suspected cancer of the stomach show either a well-developed lesion, readily found, or else a normal behavior of the stomach, warranting a negative diagnosis of cancer. Although it is obvious that a very small malignant lesion on the anterior or posterior wall might escape observation, nevertheless, it appears that a carcinoma of the stomach may be almost positively ruled out in patients whose symptoms are of long standing, but whose stomach is roentgenologically normal. With the very careful technique now possible, roentgenologic failures do not occur in the negative diagnosis of gastric carcinoma, but in cases where carcinoma is diagnosed and does not exist. As White has put it, our mistakes have been errors



of commission rather than errors of omission. The moral is to recognize the limitations of *x*-ray evidence. Even in cases where the *x*-ray examination is not required to establish an already obvious diagnosis of malignancy, it renders great aid in locating the lesion and in showing its size and extension to neighboring tissues. At times the *x*-ray evidence will demonstrate that a carcinoma is small, free from adhesions, and distinctly operable in a case which, clinically, presents such signs as would lead one to expect a large, inoperable lesion.

*The Small Intestine.*—Carcinoma of the small intestine is extremely rare. The writer has had only one case of carcinoma of the duodenum, this tumor being situated at the papilla of Vater. In this, a correct pre-operative diagnosis was made by means of the roentgen ray, the diagnosis being based upon an irregular, digitated filling-defect occurring on the median side of the duodenal shadow about two inches below the pylorus. The duodenum can be best visualized during examination upon a horizontal fluoroscope. Everything having been made ready, and the liquid food ingested, the patient lies upon the right side for several minutes. He then turns quickly upon the back and the examiner places one of his hands (glove-protected, of course) upon the abdomen, making pressure over the duodenojejunal junction. This maneuver incarcerates the barium which occupies the pyloric portion of the stomach, the duodenal bulb and the duodenum. Moderate pressure for a few moments will completely fill the duodenum so that its outline can be accurately studied.

The only roentgen finding suggestive of primary carcinoma low in the small intestine is obstruction, and upon the roentgen findings alone it will probably be impossible to differentiate between malignant obstruction and obstruction from any other cause.

Sometimes there will be a characteristic delay in the passage of barium through the ileum, or else without any actual delay there will appear 'islands' of barium here and there throughout the abdomen. Fig. 40 records such barium collections in the small bowel. This peculiar disposition of the barium is characteristic of a peritoneal thickening. When seen in connection with tuberculous symptoms or tuberculous findings in the chest, this appearance of the small bowel should be regarded as inferential evidence of a peritoneal thickening due to tuberculosis. In the presence of carcinoma of the stomach, as in this instance, one infers that it is a peritoneal thickening due to generalized peritoneal carcinomatosis. Such proved to be true at operation.

When the neoplasm involves the cecum in the neighborhood of the ileocolic valve, there is likely to occur a marked ileal stasis. In fact, this may be noted when the tumor occupies the first part of the ascending colon, providing it obstructs.

*The Colon.*—It is usually considered that carcinoma of the colon is a relatively infrequent lesion. In twenty years there were found in the Pathologic Institute of the Vienna General Hospital 3,585 cases of carcinoma, of which 343 (about 10 per cent.) were in the intestines. During this time more than 41,000 autopsies were performed. Of the 343 cases of intestinal carcinoma, 162 were in the rectum, the remainder being scattered through the colon in the order of frequency indicated in Fig. 41. It is notable that the sites of occurrence of carcinoma coincide with the sites of colonic stasis. One hears much about stasis in the transverse colon due to prolapsus of the transverse colon and kinking of the flexures, especially the splenic, but as a matter of fact, colonic stasis occurs most often in the rectum and pelvic colon, and next most frequently in the proximal colon—namely, the cecum, ascending colon and the first portion of the transverse. Why this is true is easily understood in view of our modern appreciation of the phenomenon of antiperistalsis in the colon.

Cannon showed that the prevailing movement in the proximal colon is antiperistalsis, consisting of a movement of waves backward toward the cecum. Some authors still doubt the existence of these antiperistaltic waves in the normal colon, but our roentgen studies have convinced us of the reality of this form of peristalsis in the normal human colon.

It is probable that these antiperistaltic waves normally originate at a point in the transverse colon somewhat to the right of the midline. In animals Cannon saw in the right half of the transverse colon a tonic constriction ring from which these antiperistaltic waves took their origin. The writer has repeatedly observed in man the evidences of a similar contraction ring, similarly located (Fig. 46). Boehm also, by means of the roentgen ray, has seen in human beings a similar narrowing of the transverse colon, usually to the right of the midline; and in animals opened under Ringer's solution, a definite constriction ring was seen corresponding to the ring of Cannon, from which peristaltic waves originated, some traveling toward the rectum and some toward the mouth. This ring was inconstant, disappearing and reappearing from time to time.

According to Cannon, peristaltic waves in the stomach also originate in a constriction ring, the exact location of the ring varying with the tonus and degree of filling of the stomach. The greater the distension of the stomach, providing its tonus is not decreased, the higher will be the location of this tonic constriction ring and peristaltic waves will be seen beginning higher in the stomach. So also in the colon, it is very likely that the exact location of the tonic constriction ring normally located in the right half of the colon varies with the tonicity and degree of distension of the proxi-

mal colon, just as in the stomach the same factors govern the location of the tonic constriction ring from which the normal peristaltic waves arise. In cases of severe obstruction in the distal colon, the point of origin of the antiperistalsis is moved so far distalward that it practically coincides with the seat of obstruction itself.

Fig. 49 shows the enema-filled pelvic colon in a case of carcinoma of the iliac colon. For the sake of explanation, the outlines of the colon are drawn in with white pencil, the location of the tumor in the left iliac fossa being indicated diagrammatically. It will be seen that only a small portion of the clysma passed above the tumor. The clysma was then evacuated, and an opaque meal administered. Fifty hours later the roentgen examination showed the appearances illustrated in Fig. 50. One would have supposed that the bulk of the barium meal would be found just proximal to the obstruction. On the contrary, it is seen that in this case, at least, the content of the colon is held as far away from the seat of obstruction as possible—namely, in the cecum and ascending colon, which are markedly distended. Antiperistaltic waves were seen in this case originating just above the obstruction, traveling backward along the ascending colon (Fig. 50). The white arrows indicate the direction in which the waves were traveling. The wave was seen to begin immediately above the stricture, but before the plate could be called for and exposed, it had almost reached the middle of the transverse colon.

Twenty-four to thirty-six hours after an opaque meal, one may find the appearance which the writer has termed *peristaltic unrest*, that is, alternating waves of onward and retrograde peristalsis. Fig. 50 illustrates most satisfactorily the appearance of the colon proximal to the obstruction when the obstruction is nearly complete, and the content of the colon liquid. When the obstruction is not so great, and the fluid of the colon content has been absorbed, Fig. 52 more nearly represents the roentgen appearances.

Thus it may be stated that in carcinoma of the colon, the degree of obstruction may be estimated with a fair degree of accuracy. When the obstruction is almost complete, the abdomen is usually markedly distended, owing to the gas-distension of the bowel. The roentgen examination is indicated to aid the internist or the surgeon in deciding whether the obstruction is in the small or in the large intestine, a question which influences considerably the manner and point of operative interference.

In such cases it is probably wise to begin the examination with the barium enema, following it later, if necessary, with the ordinary barium meal. When the lesion is thought to be in the colon, the enema is likely to give the earliest information. The writer has shown that even without the administration of barium, it is possible, in most cases, to locate roughly the site of the obstruction, thanks



to the distension of the bowel by the gas almost universally present in these cases. If the central portion of the abdominal shadow is gas-distended, showing the peculiar reticulated appearance characteristic of the small intestine, it is evident that the obstruction is not in the colon, but in the lower portion of the small intestine. If the cecum and ascending colon are gas distended, it is almost certain that the obstruction is in the colon and not in the small intestine.

In cases of obstruction beyond the hepatic flexure, the cecum and ascending colon may form an extremely dilated sac, the thickness of a man's arm, hanging low down into the pelvis. The content of the sac is usually fluid, and is easily recognized by its horizontal level, seen with the patient standing, which shows undulations when the patient is shaken. Above this fluid level there is usually a high-grade gas-inflation of the hepatic flexure, interlaced with haustral lines. In the middle of the transverse colon there may be another accumulation of the liquid seen only with the patient standing. When the obstruction is in the pelvic colon, there may also be fluid levels at various points in the descending colon. Except in the presence of stenosis, the colon can never contain such quantities of fluid. In cases of catarrh, or where there is liquefaction of the feces in the colon, these liquids are soon emptied. Stationary spaces filled with fluid and gas are found only in stenosis, according to Schwarz.

Antiperistalsis, alternating with onward peristalsis, can be seen in the colon proximal to the lesion, associated with borborygmi. When the obstruction is in the descending, iliac and pelvic colon, and particularly when it is located in the iliac colon, the phenomenon of antiperistalsis can be noted also in the left half of the transverse and in the descending colon. With the patient erect, there will be seen two fluid levels, one in the transverse colon, and one in the descending colon. These are seen to rise and fall alternately, much like two elevators in twin elevator shafts, one passing up as the other passes down, and vice versa.

The liquefaction of the content of the colon can only be determined when the patient is examined in the upright position. If the patient is so weak that he cannot stand, and it is necessary that the examination be made in the horizontal fluoroscope, a correct diagnosis can be made from the prominent, and sometimes really severe, distension of the colon. Even in this position, lateral studies, with the tube on one side and the screen on the other, with the patient flat upon his back, may serve to demonstrate fluid levels surmounted by gas accumulations. Severe, constant meteorism of the colon is a constant finding in organic colonic obstruction, although not pathognomonic of malignant obstruction.

In a large class of patients, carcinoma of the colon develops with-

out any higher grade of colonic stasis than that found in ordinary constipation. Both in constipation and in carcinoma, one is likely to encounter small ribbon-like stools. An appreciable swelling of the bowel with the enema and an appreciable gas distension and liquefaction of the colon contents are not seen except in the severer forms. One occasionally encounters diarrheal movements. Sometimes there occur soft evacuations with tenesmus, the symptoms being those of colitis rather than obstruction. There is little loss of weight, and the alarming symptom is the presence of blood in the stool. In this class of cases, examination by means of the roentgen ray is most helpful.

The contrast material may be introduced into the colon either in connection with a meal or by enema. The writer recommends study of the colon following the meal as being more likely to give accurate information concerning the function of the bowel, reserving the injection of the barium enema for those cases in which there is a question of gross obstruction (carcinoma, tumors, adhesion bands, etc.) and for testing the function of the ileocolic valve. Following the barium meal the studies of the colon may be carried out at the ninth, twenty-sixth, thirty-second and fiftieth hours.

Jaugeas and Friedel recommend a paste, especially for the investigation of the rectum and sigmoid. The paste consists of a mixture of vaseline and oil in equal parts, to which barium sulphate or bismuth carbonate is carefully incorporated in equal parts. This preparation can be injected with a syringe. The quantity of the injection varies with the importance of the segment to be explored. A litre usually suffices to reach the splenic flexure.

Most x-ray workers prefer the barium enema after the method of Haenisch. The Haenisch enema consists of water one litre, bolus alba 300 grm., bismuth carbonate 75 grm., and water sufficient to make one litre.

The writer's formula is as follows: To  $2\frac{1}{2}$  dr. of gum tragacanth, add about 1 oz. of alcohol. Shake well. Add 20 oz. of warm water and shake. Add 3 oz. of barium sulphate, then 20 oz. of water, shaking well each time. This mixture should be made up fresh shortly before using.

Holz knecht and Singer give the following formulæ: (a) Barium sulphate clyisma. To one litre of boiling water, a suspension of two soup-spoonfuls of finest potato starch in three-fourths of a litre of cold water is added, and after being boiled again, 160 grm. of barium sulphate and one-quarter litre of hot water is stirred with it. The mixture is then boiled for five minutes and cooled off to  $112^{\circ}$  F. This mixture can be preserved in the icebox for several days. (b) The bismuth clyisma. To one litre of boiling water, a suspension of two tablespoonfuls of finest potato starch in a quarter of a litre of cold water is added. This is boiled again for five min-

utes and 120 grm. of bismuth carbonate stirred in three-fourths of a litre of cold water is added to it without boiling again.

Ordinary buttermilk, warmed to the temperature of 100° F., serves very well as a vehicle for the suspension of the barium for enema purposes. This latter preparation has the advantage of being quickly prepared.

In administering the barium enema, the patient is placed supine upon a horizontal fluoroscope, so that the ray comes from below, illuminating a screen which lies upon the patient's abdomen or is suspended above it. In this way the progress of the injection can be watched as the fluid enters. Preliminary cleansing enemas are a requisite for these cases.

The patient having been prepared upon the horizontal fluoroscope, the rectal point is inserted not further than two or three finger-breadths into the rectum. In fact, the ordinary rectal point which passes into the bowel only a couple of inches is quite satisfactory. When a tube is pushed up too high, it folds upon itself and sometimes kinks, and prevents the entry of the enema. Furthermore, it is unnecessary to use any form of colon tube, as there should be no difficulty in filling the entire colon except in cases of organic obstruction.

One should not attempt to do fluoroscopy of the colon until the eyes have been in the dark for a sufficient length of time so that the enema-tube in the rectum can be readily seen. The eyes having been prepared, the room is darkened and the current turned on. The stopcock is then released, and in normal cases there appears in the pelvis a pear-shaped shadow which gradually increases in size, showing the filling of the ampulla. The distension of the ampulla having been accomplished, the opaque fluid begins to seek an outlet into the pelvic colon. Whether or not we shall be able to see distinctly the pelvirectal junction and the last inch or two of the pelvic colon depends upon the location and disposition of this portion of the large bowel; according to its variable position the outlet from the ampulla appears sometimes towards the right, sometimes in the middle, and sometimes toward the left. When it appears toward the left, it is usually possible to distinguish the pelvirectal angle very well, especially if the patient be turned slightly so that oblique illumination can be employed. When it appears toward the right or in the midline, the shadow of the opaque mass in the ampulla obscures the vision. In certain cases, studies by means of the stereo-plate method are exceedingly helpful.

It should be remembered that in almost every case, when the enema is injected with the patient in the supine position, there will appear to be a narrowing of the bowel where the pelvic loop passes over the iliopectineal line, at its junction with the iliac colon. The appearance of narrowing is often exaggerated by the very short



mesocolon possessed by this segment of the colon, and especially by the adhesions which often exist at this point. There first appear in the van of the advancing column several relatively small boluses showing the regular spacings due to the indentation of the haustra coli. Under the increasing pressure, however, these haustral markings are smoothed out and the bowel shadow becomes broader, darker and homogeneous. The normal pelvic colon rises higher in the abdomen during the injection of the enema, owing to the increasing pressure. When this rise of the pelvic colon fails to occur, it may be taken as evidence strongly suggestive of adhesions binding it down.

After entering the pelvic colon, and particularly after passing the ilio pelvic junction into the iliac colon, the progress of the opaque stream is uninterrupted. The enema usually flows quickly up the iliac and descending colon, where it follows a course backward over the iliac crest, upwards and forwards around the splenic flexure, forwards and downwards across the transverse colon to the hepatic flexure. There is normally the appearance of a retardation of the opaque stream during its passage around the splenic flexure; this is only apparent, as will be appreciated very easily if the patient be examined in the supine position with a tube placed laterally, the screen being held vertically against the left side; or if the colon be studied stereoscopically, the two legs of the splenic loop (the last portion of the transverse and the first portion of the descending colon) are widely separated, the descending colon lying far dorsally to the last third of the transverse colon. The kinking which is supposed to occur often in the splenic flexure is rarely very sharp, but in those cases where it does occur, the progress of the enema may be hastened by turning the patient upon the right side for a few moments. In the majority of cases, however, it will not be necessary to turn the patient from the supine position in which the injection is started.

In the transverse colon it is sometimes observed that in the mid-line in front of the spine there is an apparent filling-defect, due to the saddling of the colon over the spinal column. This is especially noted in cases of increased intra-abdominal pressure.

In the hepatic region the fluid is sometimes observed to follow a very devious course, indicating a redundancy of the bowel at this point. Very rarely indeed is there any real kinking, even when adhesions are numerous. Occasionally the fluid passes directly into the ascending colon, especially in well-nourished individuals; often it flows first in a direction parallel with the ascending and to its outer side, but later it returns and enters the ascending. Now the opaque fluid spreads rapidly, filling the ascending colon and the cecum, usually without difficulty. When the ileocolic valve is competent, the enema stops at the cecum, but in the rather large per-

centage of cases in which this valve is found insufficient, the terminal coils of ileum are seen to fill for a greater or less distance.

In brief résumé, it may be stated that the normal colon can be filled by injection within a few minutes, the patient reclining upon the back, without elevation of the pelvis or the use of the colon tube. There are certain physiological obstacles which can be overcome by waiting, by manipulation, and sometimes by change of position on the part of the patient. The greatest expansion is noted in the ampulla, and sometimes in the cecum. Excepting the ampulla, the calibre of the colon, thus filled by opaque enema, gradually increases from 3.0 cm. in the pelvic colon to 6.0 cm. in the cecum. The larger the amount of the injection, the more redundant the colon, for it expands not only in breadth, but also in length.

Normally, the opaque enema, which is perfectly bland and unirritating, proceeds through the entire colon to the cecum without exciting visible peristaltic contractions, but in conditions of inflammation or under over-distension, characteristic ring contractions may be excited. When seen, these have diagnostic value and sometimes may cause confusing pseudo-filling-defects (Figs. 44 and 45). Normally, several minutes elapse without such peristaltic waves, even after the head of the enema column has reached the cecum. The haustral markings which have been smoothed out during the entry of the enema, usually return after some time, occasionally in an instant, but usually more slowly, beginning first in the distal colon.

Following the study of the enema-filled colon, it is often very informing to watch the emptying of the enema or to study the colon immediately after the expulsion of the enema. Haenisch advises that the container, from which the injection has been made, be lowered, and the enema allowed to return by gravity. The emptying of the colon is thus watched under the fluorescent screen. This is often very inconvenient, however, and most of the aid thus obtainable can be secured by a screen study after the patient has expelled the enema.

In cases of carcinoma, the signs noted during the injection of the enema will be characteristic according to the location of the tumor. There is a characteristic arrest of the barium column at the point of hindrance (Figs. 48, 49 and 51). This arrest may be complete or may be overcome in a longer or a shorter time, according to the degree of stenosis. The head of the barium column, when it reaches the point of obstruction, may present a funnel-shaped shadow, after which the filling of the bowel may be impossible, or after a greater or less degree of dilatation of the colon below the point of obstruction, a small finger-like projection from the barium mass appears, which moves slowly upward and suddenly widens out again, filling the colon. It is not sufficient to have a nurse or

other assistant give a barium enema and then attempt to study the colon from a roentgenogram alone without screen findings. The opaque mixture must be seen as it passes in. If this fluoroscopic control of the injection is omitted, one can never know whether the flow was interrupted. In this kind of fluoroscopic work a foot-switch is essential, for it enables one to make prolonged studies without fear of injuring the patient.

The hindrance to the ascent of the barium stream may be out of all proportion to the amount of actual obstruction. This seems hard to explain, owing to the fact that in nearly all cases the ordinary meal, as well as the barium meal, when taken by mouth, passes the tumor in compact as well as in liquid condition, whereas the lesion presents an almost insurmountable obstacle for the barium enema, causing the distal portion of the bowel to overfill, producing localized pain and tenesmus.

The difference between the behavior of the lesion to injecta and ingesta can be explained, according to Schwarz, only by the theory that the tumor has adapted itself, from the earliest stages, to the pressure of the stools from above, and that its funnel is shaped by the natural direction of the stools. On the other hand, the enema, which approaches suddenly from below, instead of from above, does not find the way prepared for this abnormal direction of passage, and the absolute resistance is established, thus giving rise to the picture of valve closure, because it occurs only retrogradely (*ventilverschluss*).

The overfilling of the portion of the bowel distal to the lesion with localized pain and tenesmus, develops especially just below the point of stenosis. If the patient complains that the pain is severe, the irrigation should not be forced any further. Even the mere pressure from the irrigation might cause perforation of a disintegrating tumor.

The writer insists upon a confirmatory study of all these cases after a barium meal, for he feels it important to check up the findings of the enema by this means. As far as the colon is concerned, the first observation need not be made until the ninth hour, although for the sake of complete records, the writer always examines the entire gastro-intestinal tract in every case. Further observations should be made at the twenty-fourth, thirty-sixth and possibly also the fiftieth and seventy-fourth hours, depending upon the urgency of the case and the degree of colonic stasis.

In cases of carcinoma, attended by obstruction, there is usually a dilatation of the colon on the proximal side of the lesion. This dilatation is not necessarily great and may not be demonstrable during the bismuth examination. When present, it is evidence of a serious obstruction. The colon shadow may end at the obstruction



in a funnel-shaped process or there may be an irregular filling-defect characteristic of a cauliflower carcinoma.

There may be a palpable tumor coinciding with the filling-defect. A palpable tumor may not be present, and it hardly would be expected as a constant finding if one hopes to make a diagnosis which is comparatively early. It should be borne in mind, also, that palpable tumors in connection with bowel carcinoma may really be fecal accumulations. At times the dried fecal accumulations in the intestine, proximal to the seat of obstruction, may assume a degree of hardness and resistance to palpation as the tumor itself. One would hardly expect to palpate a tumor, even if present, if it occupied the distal leg of the sigmoid and especially if it is in that portion of the colon which lies above the costal margin. The mobility of the tumor varies, according to the length of the mesentery, and the degree of pericolic involvement. Transverse colon and sigmoid colon tumors usually possess the greatest degree of motility, and yet cases of carcinoma of the cecum and ileocecal valve have been seen in which the tumor was exceedingly freely movable. The writer believes that the presence of a palpable tumor should be considered a roentgen sign, inasmuch as the palpation under the fluorescent screen is obviously superior to the ordinary method of palpation.

Following the barium meal, the obstruction will be shown by a hindrance to the onward progress of the barium column (Fig. 47) or the condition of peristaltic unrest (Fig. 52) to which the writer has already referred—namely, exaggerated antiperistalsis, or alternating antiperistalsis and normal onward peristalsis. The writer does not refer to the *normal* antiperistalsis as a sign of bowel obstruction, but when the normal retrograde waves are *exaggerated*, this fact may be considered a sign of obstruction, analogous to the observation of antiperistalsis in the stomach in cases of pyloric stenosis. The barium-mixed colon contents may be found distributed in two zones, a large collection in the distended cecum and ascending colon, and a series of barium masses in the distal colon, proximal to the obstruction, which, on repeated examination, is seen to be in a state of peristaltic unrest, onward and retrograde peristalsis alternating. The administration of laxatives previous to the examination is likely to increase the probability of observing antiperistalsis.

It should not be understood that the foregoing sign is found only in malignant obstructions. Any kind of bowel obstruction, malignant or benign, organic or spastic, will cause this alternating peristalsis and antiperistalsis with distinctly increased antiperistalsis in a degree varying with the severity of the obstruction.

There may be no obstruction whatever, especially if the tumor occupies the cecum. Here the only evidence of tumor may be a filling-defect, such as is shown in Figs. 42 and 43. Sometimes the filling-defect is digitated, indicating a cauliflower growth; at other

times it may be annular. Coincidence of a palpable tumor with a point of hindrance or a filling-defect will be a further confirmatory sign.

There are a number of confusing factors in the diagnosis of filling-defects in the colon, particularly filling-defects which occur in the pelvic colon. One of these sorts of defects is the hiatus in the colonic shadow due to a recent peristaltic movement. (See Figs. 44 and 45.) The spasticity of the colon attending colitis or adhesions near the iliopelvic junction may narrow the lumen of the bowel to such small calibre that a carcinoma will be thought of (Figs. 53 and 54). Especially likely to confuse the diagnosis of carcinoma is a palpable mass in the left iliac fossa due to peridiverticulitis (Fig. 55). Multiple diverticula of the colon are not so rare as was formerly thought. In fact, the writer encounters multiple diverticula of the colon somewhat more frequently than carcinoma of the colon.

The roentgenologic appearances of colonic diverticula are characteristic. Following the passage of an opaque meal through the colon, one observes small rounded shadows, evidently residues of the opaque salt, in the affected areas, usually near the junction of the iliac and pelvic colon. These rounded shadows usually occur in groups, always maintaining the same relation to each other. They are best seen on the second or third day, when, by careful screen study, especially during manipulation of the iliac and pelvic colon, one may detect the presence of these rounded shadows. Stereoroentgenograms often conclusively show the relation of these small rounded shadows to the bowel. It most often happens, however, that the barium residues are not recognized until the second or third day, after most of the meal has been evacuated. It is then especially illuminating to administer a barium enema, studying the relation of the rounded shadows to the enema-filled bowel. This study may be carried out fluoroscopically, but roentgenograms are especially graphic, and in view of the rarity of the situation are especially desirable. As above mentioned, stereoroentgenograms furnish the most decisive evidence.

The diagnosis may sometimes be made by means of the enema alone, but it is important that in such cases the enema may be retained for some time. It usually occurs that in these cases the patient is able to expel the enema only from the rectum and lower pelvic colon, the remainder of the enema being retained. Study of the patient half an hour to an hour later will frequently demonstrate the filling of the diverticula in cases where they do not show immediately after the enema. In this manner many of the smaller diverticula may be demonstrated.

In Abbe's case, examined by LeWald, the diverticula retained bismuth up to the tenth day. In one of the writer's cases of multiple diverticula, on the sixteenth day they were seen still to contain barium and doubtless retained it for a much longer period.

ON THE ETIOLOGIC RELATIONSHIP EXISTING BETWEEN  
GASTRIC ULCER AND GASTRIC CANCER.

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Nearly two years ago, I reported<sup>1</sup> observations upon 556 operatively and pathologically demonstrated instances of gastric cancer. The study was made particularly with the object of determining the evidences pointing to the relationship existing between gastric ulcer and cancer of the stomach. Since the above report, records have been made of 355 additional proved cases of gastric cancer. There is consequently a total of 921 instances of the disease now available for review. As a parallel study, I have tabulated the points of value in 500 operatively demonstrated cases of benign gastric ulcer.<sup>2</sup> In this paper, which is of the nature of a preliminary summary, it is intended to indicate what are considered the main facts which appear to have been established by my study of the combined material.

## I.—THE NATURE OF GASTRIC ULCER.

(a) *Origin*.—All types of benign gastric ulcer may be produced experimentally by a wide variety of methods. Bolton<sup>3</sup> classifies some of the more familiar causative agents as (1) *bacteria* (pneumococci by Dieulafoy, staphylococci by Widal and Meslay, staphylococcus aureus by Letulle, bacillus pyocyaneus by Charrin and Ruffer, bacillus dysenterii by Chantemesse and Widal, lactic acid bacillus by Wurtz and Leudet, bacillus of Pfeiffer by Slatineano, meningococcus of Weichselbaum by Gaudy and Griffon, Eberth's bacillus and bacillus coli by Rodet and Zaidmann, streptococcus by Rosenow); (2) *bacterial toxins* (pyemias by Lebert and by Cohn, diphtheria toxin by Enriguez and Hallion and Rosenau and Anderson); (3) *cutaneous burns* (Welty, Ponfick, Silbermann, Parascandolo); (4) *poisons of metabolic origin* (Bolton's 'gastrotoxin' injected intraperitoneally or subcutaneously); (5) *extrinsic poisons* (mercury salts, arsenious acid, cantharidine, vegetable alkaloids, pilocarpine and atropine, copper sulphate); (6) *poisons introduced into the stomach* (corrosives and caustics), and (7) *alterations in the stomach's circulation* (vascular blocking, thrombi emboli, arteriosclerosis, or nervous inhibition, external pressure). The type of ulcer produced experimentally may vary slightly according to



the method employed in causing it. The resultant lesions are, however, essentially similar. There is loss of surface epithelium, necrosis, inflammatory edema, hemorrhage and glandular destruction. In the healing of ulcers, irrespective of the way they may have been produced, the essential feature consists in development of protective connective-tissue by hyperplasia, with resultant scar.

(b) *Course*.—In neither experimental animals nor the human can the life history of any gastric ulcer be prognosed. This applies with respect both to the extent of the lesion and the amount of tissue destruction taking place. That most gastric ulcers have a natural tendency to heal is shown by the rapid appearance of scar formation in experimental animals, the discovery of healed ulcers at laparotomy or necropsy, and the clinical 'cure' of ulcers by widely varying modes of medical or surgical treatment. The time required for ulcer formation or the healing of such seems to vary widely. There are factors concerned which appear to be largely individual. Certainly, chronicity of an ulcer pathologically does not necessarily coincide with chronicity in the sense of duration in terms of months or years. Huge, excavated calloused ulcers may form in a few weeks and superficial, bleeding erosions or small calloused ulcers may exist for years with no evident extension or marked connective-tissue hyperplasia.

(c) *Malignant Change*.—That some factor other than the persistent presence of an ulcer in a functioning stomach is necessary to result in the transformation of a benign process to a malignant one is apparently indicated by the fact that no experimental method has ever produced in animal or man a cancerous ulcer. Chronic irritation, infection, artificial anemia, starvation, overfeeding or local application of chemicals have all failed to bring about any such process as we see in *ulcus carcinomatosum*, *i. e.*, the power of atypic, unlimited growth with the ability to cause death of the host by malignant intoxication and metastases. Just how such change can be possible in man we are not able to state. Herein lies one of the strong points of argument for those clinicians and pathologists who claim that benign gastric ulcer rarely becomes malignant. No one has ever seen the actual transition from a benign process to cancer. In a given specimen examined microscopically, one can only say that cancer is or is not present. Atypical hyperplasias may render a diagnosis of early malignancy highly probable by one experienced in the examination of fresh tissue, but it appears impossible to state definitely that an ulcer which shows cancerous changes in a few spots of its edge was ever anything else than malignant. Certainly one cannot say absolutely that the part of the mucosa that has necrosed and sloughed was benign. That part may have been wholly cancerous and prevented from wider incursions into the gastric wall by the very atypical

hyperplasia, so-called, that remains for our study. What we see may be an indication of a histologic battle, already a partial victory. The subsequent spread of the few malignant rests, which are evident, may follow as a consequence of the exhaustion of the protective mechanism as a sequence of the first attempt at defence. When an ulcer is excised at laparotomy the histologic struggle is interrupted. One cannot satisfactorily prognose what the ultimate outcome would have been had the conflict been allowed to proceed. It is only when one observes gross cancerous ulceration with evidences of perigastric lymph-gland invasion that it is possible to state that the disease will progress to the death of the host.

(d) *Frequency of the Transition of Benign Gastric Ulcer to Cancer.*—There has been much misunderstanding on this point. The publication of reports claiming that the clinical type of dyspepsia, which frequently precedes what is commonly recognized as a malignant form of gastric disease, is often not to be differentiated from that of chronic peptic ulcer, has given rise to a widespread impression that *vice versa* a like number of chronic gastric ulcers terminate as cancers. Clinical experience and pathologic facts are far from lending support to such conclusion. While our study of the early history of 921 instances of gastric cancer indicates that more than 65 per cent. of the cases had a long dyspeptic course (apparently of benign type), preceding that which we clinically interpret as malignant, it does not establish the fact that a like proportion of benign gastric ulcers eventually terminate as cancer. Granted that the so-called precarcinomatous manifestations of gastric cancer closely simulate those of benign peptic ulcer, it is not unlikely that the common conception, clinically, of the symptomatology of ulcer and of cancer of the stomach is an imperfect one. As there is histologically a group of ulcers where sections do not permit of accurate differentiation between benignness and malignancy, it is not improbable that there are stages in both gastric ulcer and cancer where clinical segregation is impossible. The general conception of how ulcer and cancer of the stomach make themselves manifest may be too narrow.

Pathologically, the strongest proof that exists of the frequency of the histologic transition of benign ulcer to malignant ulcer is advanced by MacCarty.<sup>4</sup> From a most complete and painstaking study he has demonstrated that of 280 resected, chronic, calloused gastric ulcers, in which there was no clinical or gross surgical hint of malignancy, 63 per cent. showed evidences of atypical or undifferentiated cells in their hyperplastic edges. This is an important grouping of facts and has highly suggestive application clinically, but etiologically, as MacCarty frankly admits,<sup>5</sup> it carries no proof that those ulcers showing atypical cell arrangement and structure were ever benign, histologically. While the length of

the period of dyspepsia associated with the demonstration of these ulcers might clinically indicate a previously benign process, it does not prove that such actually existed. Our conception of the time of possible duration of malignancy may require readjustment. On purely empirical grounds, the clinical picture of gastric cancer has become firmly established as one of a perniciously and progressively downward process, with fatal termination within from one to two years. How long malignant alterations can exist in a stomach before clinical evidences present, we do not know. The disease may have been 'latent' for years before local or constitutional changes became manifest. More than 1.5 per cent. of our cases of well-advanced gastric cancer gave rise to no symptoms directly pointing to a gastric upset. The common knowledge that gastric ulcers may exist without producing so-called 'ulcer dyspepsia,' is proved by the not infrequent finding of calloused gastric ulcers at laparotomy for other ailments or at necropsy. It is thus evident that it is impossible to indicate the histologic status of any gastric mucosa, from clinical manifestations alone, previous to the clinical proof that cancer has developed;—foundation for the neoplasm may have long been present either as ulcer or as some yet unknown cellular mal-arrangement or intracellular metabolic fault.

There has been much ancient and recent controversy among clinical observers relative to the frequency with which gastric ulcers terminate as cancers. The problem has yet to receive its final solution. While internists or surgeons with meagre laboratory or operating-room experience claim that a very small proportion of calloused gastric ulcers become cancers, the admission that such ulcers, clinically, do at times act as forerunners of cancer, creates at once a situation with diagnostic and prognostic importance. In 1882 Zenker<sup>6</sup> stated it as his opinion that all gastric cancers arose from previous benign ulcers. Seven years later, Rosenheim<sup>7</sup> supported this observation. In 1902, Futterer,<sup>8</sup> after extensive experimental study, advanced the suggestion that gastric cancer develops with great frequency from pyloric ulcer, but that such transition is less common in ulcers located in other parts of the stomach. Fenwick,<sup>9</sup> from experience mainly clinical, claims that but 3 per cent. of gastric ulcers become cancers, but offers no suggestions as to how it is possible to know which ulcers will remain benign and which will become cancerous. From a recent study, Friedenwald<sup>10</sup> would place the frequency of cancers having originated from previously benign ulcers at 7.3 per cent. Moynihan<sup>11</sup> claims that fully 66 per cent. of his cancer cases had been affected previously with chronic gastric ulcer. Sapeska,<sup>12</sup> after a recent review of 100 cases of gastric cancer, could find but 10 instances where previous calloused ulcer had not apparently existed.

My study of 500 surgically demonstrated cases of gastric ulcer



in no way indicates the frequency of cancer formation from such. That this is to be expected is emphasized by the fact that our cases are all classified upon a pathologic basis, *i. e.*, a specimen is either benign ulcer, undetermined ulcer histologically or gastric cancer, with or without the association of ulceration. Presuming that our 500 cases of gastric ulcers form part of a group of ulcer cases which arose at some time previously, it is manifestly impossible to tell what course the original ulcer group has taken—namely, how many have healed spontaneously or with the aid of medical care, how many have survived as benign ulcer cases, or on how many have surgical procedures been performed, and how many have terminated as cancers. In our opinion the above facts furnish insurmountable obstacles to the possibility of any, even approximately correct, estimate being made with regard to the frequency with which benign gastric ulcer becomes cancer. Whatever may be individual opinion or clinical experience, this phase of the subject remains, as yet, unsettled.

(e) *Clinical Variations in the Symptom-Complex of Gastric Ulcer.*—That a difference of opinion exists among clinicians with regard to what set of symptoms and signs indicate peptic ulcer is readily noted upon the perusal of the observations of those men who have had experience with any considerable material. Symptom-complexes, based solely upon individual interpretation of a group of complaints, signs or tests, cannot expect unqualified acceptance. However, when certain clinical pictures of disease are found in association with the pathologic proof that such disease exists, symptom-complexes can be rationally formulated,—and only when measured by this rule are such above criticism. The close simulation of the symptomatology of uncomplicated gastric ulcer by disease of other abdominal organs (gall-bladder, appendix, kidney, spinal cord, etc.) would appear to suggest that the clinical manifestations often associated with such an ulcer are the evidences of an abdominal or a constitutional disarrangement, in the course of which gastric ulceration is an incident or an end-result. Certain support to this conception of the disease is furnished by the experimental production of gastric ulcers by many and widely differing methods and agents. It is within the experience of all who have had a liberal training, that not infrequently laparotomy or necropsy, at the most competent hands, fails to demonstrate ulceration in patients presenting so-called characteristic clinical manifestations of the ailment. Conversely, it is equally surprising to discover well-advanced gastric ulcer that has produced no symptoms referable to the stomach, at laparotomy for other diseases or necropsy following *exitus* consequent upon accident or extra-abdominal affection. From the foregoing, it would appear likely that the symptomatology which is commonly associated with gastric ulcer,

clinically, is the composite manifestation of a group of derangements among which we may include ulcer of the stomach. The above would appear to impose another limitation to the accuracy with which it is possible to determine the relationship between gastric ulcer and gastric cancer. It is not beyond probability that masses of evidence which have been adduced from purely clinical symptomatology determining the diagnosis are not germane to the subject, inasmuch as in many instances peptic ulcer did not actually exist.

(f) *Malignant Change in Duodenal Ulcer.*—In a consecutive series, our 500 operatively demonstrated instances of gastric ulcer were found to exist in 1,725 cases of peptic ulcer. It is thus seen that the ratio existing between the frequency of gastric ulcer and duodenal ulcer is as 1:2.45. While duodenal ulcer is much more frequent than is gastric ulcer, cancer of the duodenum is very uncommon. From a careful perusal of records, I noted it 9 times. It has been advanced that if gastric ulcer frequently undergoes malignant transition, then one should expect a high ratio of malignant duodenal ulcers. When cancer of the duodenum is found, it is commonly located at or near the papilla of Vater. In such situations the viscus is liable to injury from gall-stones, altered secretions of the liver and the pancreas, and infective processes from the gall-tract. Moreover, at the papilla of Vater, there may be stagnation of duodenal contents or slowing of the rate of discharge of the digestive juices from the liver and the pancreas. It should also be emphasized that ordinarily, there is little opportunity of traumata to the duodenal mucosa as a consequence of retarded food progression. Food remains for a very brief time in the duodenum, provided stenoses do not exist. The opposite condition exists in the stomach, in which event there is abundant time for bacterial, chemical or mechanical injury to a gastric lining already robbed of some of its resistance. That the duodenum appears to have an inherent protective mechanism against malignancy appears to be demonstrated by the observation that only rarely does cancer of the stomach extensively involve the duodenum by direct extension. The different character of the tissue of this part of the gut seems to be evidenced by the fact that not infrequently duodenal ulcers, which have extended to the pylorus, assume malignant change in the stomach edge and nowhere else.

(g) *Gastro-Enterostomy as a Protection Against Malignant Transition of Gastric Ulcer.*—Given a gastric ulcer, proved to exist by laparotomy, if such ulcer be not excised, it appears to have been shown by competent observers that after gastro-enterostomy malignancy rarely supervenes. In our series, there were seven instances where apparently benign gastric ulcer, appeared later with cancer of the stomach after anterior or posterior gastro-

enterostomy had been performed. Of course, inasmuch as none of these ulcers had been microscopically examined before gastro-enterostomy, it is not possible to state that such were not malignant at the time that the operation was performed. It should be recalled that modern surgeons do not consider gastro-enterostomy as a mere operation of 'drainage.' It is well recognized that after such surgical procedure, the physiology of the stomach has been altered in many particulars: not rarely, the stomach's emptying power is accelerated and thus stagnant food, often very foul bacteriologically, remains for a shorter time in contact with a damaged mucosa; blood and lymph circulations may be appreciably changed as a consequence of relief from dilatation of the stomach and alterations in the peristaltic rhythm; in nearly 85 per cent. of gastric extracts of cases where gastro-enterostomy has been made it is possible to demonstrate by chemical or microscopic means, both duodenal and jejunal contents—material from parts of the gut relatively immune to malignant disease, and finally, after gastro-enterostomy, we were able to demonstrate in a series of 121 consecutive instances of gastric ulcer, an average decrease of 17 of free hydrochloric acid, together with appreciable diminution in peptolysis. Clinically, it is the general experience that in malignant disease of the stomach not associated with stenoses, gastro-enterostomy appears to grant a longer lease of life than where such has not been performed.

## II. THE NATURE OF GASTRIC CANCER.

(a) *Origin.*—No one has ever seen the actual beginnings, histologically, of malignant disease of the stomach. While the experiments in tumor transmission of Rous and Murphy<sup>13</sup> reveal certain tissue reactions to the presence of artificially introduced foreign cells, it cannot be said that such reactions are entirely comparable to those occurring when a tumor arises spontaneously from native tissue. MacCarty has apparently shown that malignancy begins as a form of hyperplasia of existing cell structures. This hyperplasia results in functionally undifferentiated and architecturally imperfect primary cell elements. This hyperplasia varies in degree, and at certain stages cannot be segregated, histologically, from the forms of hyperplasia common in processes definitely benign. Apparently, in certain of these grades of hyperplasia, the line of demarcation between the malignant and the benign is, with our present methods of examination, extremely fine. In the case of gastric cancer, however, once this 'halting stage' is passed, the distinction is sharp and the progress of the disease rapid. Evidence strongly supporting the pathologic proof that malignancy may develop in gastric ulcers that were apparently benign, is furnished by the histologic observation of all degrees of hyper-



plasia—benign, indeterminate and malignant—in sections through different portions of excised ulcers.

(b) *Course*.—Unless total extirpation is possible, gastric cancer produces death of its host. Unlimited growth, with the property of developing metastases in near or distant organs, rapidly results in fatal malignant intoxication, hemorrhage, starvation or exhaustion. Rarely do proved instances of gastric cancer live longer than three years. Unless there is early surgical interference, the majority of hosts die within a year following the onset of symptoms. In our cases of cancer of the stomach, the average duration of all symptoms of a clinically malignant type was 6.9 months previous to the patients coming for relief. There are wide variations in the rate of progress of the disease. The same type of ailment, histologically, proceeds with strikingly different speed in different individuals. The factors concerned in the ability of gastric mucosa to resist cancer invasion are not as yet understood. One individual may be overwhelmed with the disease in a few weeks while another may successfully resist the process for several years.

The above observations offer suggestions respecting the possibilities for variability in the symptom-complex of gastric cancer. Our records show that nearly 2 per cent. of operatively demonstrated instances of the disease, gave no pre-laparotomy manifestations that pointed to an ailment of the stomach. Clinically, however, the major portion of the cases fell into two great groups, with respect to course: (1) *Instances where a chronic dyspeptic disturbance, clinically benign in character, was followed by an ailment of the stomach which from its inception appeared clinically malignant, and* (2) *instances where a continuous and progressively downward disease, clinically malignant, arose in individuals who had had no previous digestive faults.*

*Group 1*.—There were 520 cases (56.4 per cent.) comprising this class. In 436 instances (47.3 per cent.) the portion of the history preceding that apparently carcinomatous was clinically that which is commonly accepted as meaning benign gastric ulcer. In 84 cases (9.12 per cent.) the dyspepsia previous to the onset of clinical malignancy was of benign type, and of the character which is commonly associated, clinically, with irregular gastric ulcer. The average duration of all symptoms in the apparently benign portion of the history was 11.2 years for both divisions. The average duration of all symptoms which clinically indicated the onset of a malignant disease was nearly 6 months.

On account of the variability in a clinical complex indicating absolutely the presence of gastric ulcer, the above figures do not actually prove that peptic ulcer had existed before the beginning of a gastric disease which was later shown to be cancer. It is significant, however, to recall that clinically the segregation of the cases, making

up this group, conforms to the accepted clinical complex of gastric ulcer, and that in large series of cases when patients presenting such symptoms are operated upon, chronic, gastric ulcers are found. Moreover, on further analysis of the laparotomy findings in cases making up this group, above defined, a disease process still localized and frequently presenting the macroscopic characteristics of chronic indurated ulcer was demonstrated. Cancerous ulcers were found in nearly 42 per cent. of instances, and with such was associated the minimum of perigastric, lymph-gland invasion. Finally, certain interesting, and perhaps suggestive, facts may be adduced from note of the incidence of hemorrhage in our series of gastric cancer. There were 151 instances where during the course of the entire ailment, gross hemorrhage had occurred (16.4 per cent.). Of the whole number bleeding, 93 cases (62 per cent.) were included in the group where dyspepsia of the ulcer type, clinically, had preceded that evidently cancerous. Of the whole number with history of melena or hematemesis, 77 cases (51 per cent.) had bled at least two years previous to their coming under observation. Of the instances having hemorrhage within two years of observation, 55 cases (76 per cent.) gave histories classifying them into the ulcer-dyspepsia, clinically, preceding clinical cancer.

From the above it is apparent that in the large majority of gastric cancers there is a previous long-term history of a type which it is impossible to separate clinically from benign, gastric ulcer dyspepsia; that the minority of gastric cancers arise in the stomachs of individuals who have previously had no gastric upsets; and that recognition of these facts permits laparotomy at a stage of the disease when the maximum advantages, surgically, can be taken of a localized process, with a consequent high proportion of cures.

*Group 2.*—In this class—that forming the group commonly considered, clinically, gastric cancer—there were 294 cases (31.9 per cent.). The average duration of all symptoms of stomach malfunction was 7.2 months. Careful questioning failed to elicit dyspepsia of any clinical variety, previous to the inception of that evidently malignant, from these patients. This observation does not prove that such individuals had had no gastric pathology prior to their appearing with cancer. While it is relatively uncommon for ulcer or cancer to exist without the production of digestive upset, as we have already mentioned, such a condition is not absolutely impossible. That gastric ulcer had not existed for any considerable period previous to the onset of cancer appears highly probable when we recall the fact that fully 4 of every 5 instances of surgically proved cases of that disease are associated with a fairly definite train of signs and symptoms. That gastric cancer had lain 'latent' for a considerable time before giving rise to clinical manifestations, is, of course, possible, but in view of our knowl-

edge of malignant processes in other body tissues, scarcely probable. Inasmuch as we have very little definite information with regard to the rate of growth either of gastric ulcer or cancer in terms of weeks, months or years, it is not possible to state that the whole gamut of initial trauma to the gastric lining, ulceration and malignant change is not (in instances in this group) run through in relatively short time. In this class of laparotomy, cancerous ulcers were demonstrated in 56 cases (19 per cent.). These may have resulted from ulcers previously benign, from necrosis and sloughing of primary cancers, or the malignancy may have arisen primarily in ulcer form. From our present histologic knowledge, there is nothing revealed upon the examination of these neoplasms that indicates the type of the initial process.

(c) *Position in the Stomach Wall of Gastric Ulcers and Gastric Cancers.*—In 37 per cent. of our cases of cancer, the neoplasm was located at the pylorus; in 28.2 per cent. on the lesser curvature or antrum; in 18.3 per cent. it was general; in 6.8 per cent. on the posterior wall; in 5 per cent. at the cardia; in 1.3 per cent. on the greater curvature; in 0.65 per cent. at the fundus and in 0.5 per cent. on the anterior wall. In approximately 3 per cent. of instances the location of the growth was not exactly determined.

The above figures are to be contrasted with such given for the situation of gastric cancers by observers who have studied mainly post-mortem material (Welch, Brinton, Lebert and others). To anyone who has examined the end-results of gastric cancer at necropsy, it is not necessary to state that at such times accurate localization of the initial seat of the disease is impossible. These figures for situation of gastric cancer that have been returned from the laparotomy examination of patients are of considerable significance, when it is observed that they approximate closely the figures given by Welch and myself for the location of chronic, indurated gastric ulcer. From the etiologic point of view, there may be more than a coincidence between the similarity of situation of gastric cancer and gastric ulcer.

#### RECAPITULATION.

Review is made of certain phases suggested by the study of 921 operatively and pathologically demonstrated cases of gastric cancer and of 500 similarly proved instances of benign, peptic ulcer. Particular attention has been paid to the search for actual facts demonstrating the existence of an etiologic relationship between gastric cancer and gastric ulcer.

It seems to have been shown that benign gastric ulcer can be produced in a multitude of ways, the method of production having but relative effect upon the ulcer resulting, pathologically. It seems



that in a given gastric ulcer it is impossible to prognose its course, duration or type of termination.

There are no experimental, clinical or pathological data that absolutely demonstrate the mechanism of the malignant transition of benign gastric ulcer. This problem will apparently remain unsolved until the exact nature of the mechanism of malignant processes in general is determined.

Clinically, the histories of instances of gastric cancer strongly suggest that such neoplasm arises most frequently from chronic, calloused gastric ulcer, clinically benign. It would appear that clinically it is impossible to segregate that group of chronic gastric ulcers which will undergo change to cancers from that which will continue as self-limited, benign processes. On account of the uncertainty in this regard, free excision of all chronic gastric ulcers should be performed whenever such procedure is mechanically possible. That this is a most important feature of cancer prophylaxis is proved by the fact that when gastric cancer can be definitely diagnosed, clinically and macroscopically, at laparotomy, hope of radical cure is slight. The knowledge of the foregoing facts imposes a moral responsibility upon internists and surgeons with respect both to the individual patient and the human family.

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## THE CANCER PROBLEM AND THE MODERN METHODS OF TREATMENT OF MALIGNANT TUMORS.

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It is a generally accepted axiom in medical research that a true scientific study of a disease begins only after its etiology has become known. Since we are as yet completely in the dark as regards the etiology of malignant tumors, it does not seem feasible to discuss a 'cancer problem,' in the sense of a scientific study of cancer as a clinical entity. But, on the one hand, there are subjects for scientific study in a disease process which are entirely independent of the etiology of the disease, as for instance, tuberculosis. The so-called lupus problem is a study in itself entirely separate from the study of pulmonary tuberculosis. The discovery of Koch's bacillus did not aid materially in the solution of various problems connected with the lupus question. Pulmonary tuberculosis, surgical tuberculosis and lupus, though all caused by the same bacillus, are three independent clinical entities and each presents different problems to the investigator. On the other hand, the genesis and the characteristic features of malignant tumors present biological phenomena which it is possible to investigate scientifically though the primary etiological factor of the disease is not known. Clinically, the various kinds of malignant tumors differ at least as much as pulmonary or surgical tuberculosis, or lupus. None the less, they all have in common the main characteristic of malignancy—namely, the unlimited proliferation of the tumor cell. This characteristic of the cells of malignant tumors differentiates them from all other normal or pathological cells of the organism. The unlimited proliferation of the cancer cell is responsible for all the clinical manifestations of the various malignant tumors, and it therefore remains the chief object in the scientific study of the disease irrespective of the possible nature of the etiological factor.

The prevailing opinion of the pathologists and research workers to-day is that some intrinsic local or general abnormality of the organism is the primary cause which changes a certain group of normal cells into tumor cells. All the farther manifestations of the disease are due to the life functions of those changed cells. Should the future show that this conception is not the correct one

and that the only other possibility—namely, the existence of a specific parasite be shown to be true, the manifestations of the disease will still be due to the functions of the tumor cell. Whether such a parasite only changes the nature of the first group of cells and remains *in situ*, or it multiplies with the multiplication of the tumor cells and forms a symbiosis with each newly produced tumor cell, still the tumor cell *per se* will remain the prime subject for investigation.

Thus the *cancer problem* as a theoretical biological study means the study of the life functions of an abnormal cell, and depends for its progress upon the general progress in the study of the physiology and chemistry of the cell. Again the cancer problem may mean other subjects of investigation. It may imply the search of ways for the most efficient methods of alleviation of the suffering, the prolongation of life, the cure of cancer patients, the means for the prevention of the disease. Thus the cancer problem has a double meaning: the theoretical investigation of the biological phenomena and the clinical study of the manifestations of the disease.

#### EXPERIMENTAL OR BIOLOGICAL CANCER RESEARCH.

The beginning of experimental cancer research dates from 1901 when Jensen, in Denmark, and Leo Loeb in this country showed that in white mice and rats the disease occurs not only spontaneously, but also that it may be induced artificially in a previously healthy animal. Until then only anatomical study on human material was available. Such information was not sufficient to determine the etiological factor, or even to ascertain definitely whether a malignant tumor grows through the multiplication of the tumor cells or whether the adjacent normal cells are continually changing their character and become malignant.

Since Jensen's first publication an immense amount of work was done on the inoculable tumors of the lower animals; and while no clearer understanding as to the etiology of malignant tumors was obtained, a great many facts were discovered of importance for the understanding of the genesis of the disease. It was shown that at least in mammals a successful growth of the tumor in a new host can be obtained only through inoculation of living tumor cells and the further growth of the inoculated tumor is also caused by the multiplication of these foreign cells and not by any change of the host's own tissues. The only notable exception to this rule is observed not on mammal but in a fowl. Rous has shown that a sarcoma of the fowl may be propagated by an injection of a filtrate of the original tumor. Whether this latter tumor is completely analogous to the malignant tumors of mammals and man is still under discussion. The study on inoculable tumors has shown further that the proliferating capacity of the tumor cells is truly limit-



less. While in an individual animal or patient the proliferating power is limited by the death of the host, the cells of the inoculable tumor by constant reinoculation may be kept alive nearly indefinitely.

The most important phenomenon observed in the study of experimental cancer consists in the so-called immunity or resistance of certain animals to the growth of the inoculated tumors. This resistance depends upon a number of various complex conditions. The writer, as a result of a series of investigations on the subject of immunity in experimental cancer, came to the following conclusions as to its mechanism: The condition of immunity in experimental cancer, while not identical, is probably similar to the immunity in bacterial diseases and is due to an active inhibitory influence of the organism of the host upon the proliferative power of the cancer cells. Furthermore, the investigations of the writer have shown that such an inhibitory action may exist locally in a certain organ while the rest of the organism of the animal is susceptible to the growth of the tumor. Such a local inhibitory influence of an organ is destroyed when it becomes diseased.

The phenomenon of general inhibitory activity or general immunity of the organism against the growth of cancer is undoubtedly of paramount importance from the theoretical standpoint, but for the practical application of our knowledge of the pathogenesis of the disease, the factor of the local organ immunity and of the possibility of destroying this immunity artificially is of greater importance.

In men who reach the cancer age only about 10 per cent. die of cancer; it is possible that the rest, or fully 90 per cent., are immune against the development of cancer. The general active immunity, the nature of which we do not know as yet, is consequently of such general occurrence that it seems plausible to suppose that when the local irritation in a certain organ is great enough, then cancer may develop even in an organism which is generally immune against tumor growth.

It is thus apparent that while experimental cancer research has not yet led to practical results, it is of the greatest importance for the elucidation of the mechanism of tumor growth. Future study on the subject will undoubtedly bring further fruitful results.

#### CLINICAL CANCER RESEARCH.

It was indicated above that clinical cancer research occupies itself with problems more immediate to the needs of the human patient in preference to the more abstract problems of experimental research. But it must not be inferred from this that clinical research excludes animal experimentation. Just as well as a Wassermann test in syphilis or a bacteriological investigation of a doubt-

ful case of surgical tuberculosis can be accomplished without the aid of the laboratory animal, so can clinical cancer research be pursued without the aid of the laboratory and the laboratory animal. Equipped with the existing knowledge of the pathogenesis of cancer, the clinician is striving to evolve a safe method of diagnosis and an efficient mode of treatment of human cancer. These are the principal tasks of clinical research.

#### DIAGNOSIS OF CANCER.

The difficulties of early clinical diagnosis of cancer are so great that very frequently no conclusion can be reached notwithstanding the most painstaking and thorough application of all the clinical methods of diagnosis at our command. In view of this, a very active study is being made in recent years of the blood-serum, the urine and the other fluids of the body with the aim in view to find some specific diagnostic test. The search for a serum test appears to be the most promising line of investigation. Of the latter, the so-called Abderhalden test finds most favor among the investigators. In a recent study on the subject, the writer came to the following conclusions: While the test is most frequently positive in carcinoma, it cannot be considered actually specific, since the same ferments seem to appear in the serum of non-carcinomatous individuals. Nevertheless, the applicability of Abderhalden's test for the diagnosis of pregnancy and the result of experimental work on animals indicate that action of the specific ferments may be shown under certain conditions. It is imperative, therefore, that a great deal more research, both experimental and clinical, be done before a decision can be reached as to the applicability of the test for the clinic. It must be borne in mind that the Wassermann test antedates the discovery of the *spirochæta pallida*. It is just as possible that a specific diagnostic test will be found for cancer before the etiology of the disease will become known. A search for such a test in cancer is imperative and is a very important function of clinical cancer research, and it must be pursued though it requires the aid of the laboratory and animal investigation.

#### TREATMENT OF MALIGNANT TUMORS.

A great deal of energy and work is being spent in the attempt to find a general specific method for the treatment of malignant tumors. The majority of the so-called *cancer cures* which spring up to fame in a day and are sent to oblivion shortly after are purely empirical in their character. The substances used are not selected with a view of an *apriori* possible specific action. A very good sample of such a remedy is a cancer cure which has been exploited recently in the daily Press, and which consists of a mixture of al-

most a dozen of herbs the majority of which were never tested pharmacologically or in any other manner.

There is a great deal more scientific reasoning in the methods of serum or vaccine therapy of malignant tumors. The methods consist either in the introduction of an emulsion of cancer tissue into the organism of a cancer patient or in treating the patient with blood-serum of an animal previously treated with human cancer tissue. It is plausible to maintain apriori that a cancer cell is so different from a normal cell of an organism that it may create and send into the circulation of its host abnormal enzymes. Such enzymes may create antienzymes or other antibodies in the blood-serum of the animal into whose circulation cancer emulsion was injected. These antibodies may produce a deleterious effect upon the malignant tumor cells when injected into the circulation of the patient. This hypothetical reasoning may be apriori correct, but it must take years of further research before a better knowledge will be obtained of the nature of the enzymes, of their structure and functions. Only then will it be possible to create a scientific method of ferment or serum therapy for the treatment of malignant tumors. The present methods of crushing cancer tissue, embryonic tissue or normal organ tissue and injecting it into a patient or into an animal preparatory to obtaining serum, the methods of autolizing cancer or normal tissue and injecting it into a patient, represent extremely coarse and crude conceptions of the fine mechanism of endocellular functions. The same is true in regard to the various attempts at establishing a chemotherapeutic method for the treatment of malignant tumors.

Thus the most promising methods of treatment of malignant tumors at present are based on the fact that cancer remains during a great part of its development a local disease, and even the secondary metastatic tumors begin in their respective regions as purely local processes by the growth of a minute group of transported cancer cells surrounded by normal tissue.

In view of this it seems reasonable to expect apriori that a great deal may be accomplished by correct methods of purely local therapy. Indeed, in recent years the success of such local treatment was very considerable. The paramount of these methods is *surgical therapy*.

The modern surgical treatment is based on the fact that cancer spreads locally and through the regional lymph-glands. It seeks to remove all the normal tissue adjacent to the malignant tumor and into which the latter spreads most frequently. The rule of modern surgery is also to make the incisions in the normal tissue as far from the tumor as safety will permit and furthermore to remove all the regional lymph-glands. By these methods, devised on the basis of



anatomical and clinical research, brilliant results have been obtained during the last two decades. None the less, operative statistics show that a comparatively small percentage of cancer patients can be cured by surgery alone to-day. Only in carcinoma of the lip the radical cure by the aid of the so-called block dissection of the tumor and the regional lymph-glands is as high as 70 to 83 per cent. In carcinoma of the breast, Halstead, who is one of the best operators of this condition, reports that 38.8 per cent. of the cases which were operated remained well for three years and over. Since not all the cases examined are operable, probably not more than 30 per cent. of the cases of carcinoma of the breast can be cured by surgery alone. In regard to carcinoma of the uterus, Wertheim, the greatest authority on the surgical treatment of this condition, states that about one-half of the cases which come to him are operable, and of these about one-half are cured by the operation, consequently about 25 per cent. of the cases of carcinoma of the uterus may be cured by operative treatment. Wm. J. Mayo, who is one of the most brilliant operators in the world, reported recently on 996 cases of carcinoma of the stomach. Of these, 344 cases only were operable, and of the latter 25 per cent. remained cured five years and over after the operation. In other words, about 9 per cent. of cases of carcinoma of the stomach can be cured by surgery alone in the hands of a Mayo and probably an even smaller percentage in the hands of most other surgeons. In all, rather less than 30 per cent. of cancer patients can hope to be cured by the aid of surgery alone. It is also safe to assume that there can hardly be expected any further progress in surgical treatment of malignant tumors. The latter are usually situated in close proximity to the vital organs, the injury of which would endanger the life of the patient. There is consequently set a limit to the length to which a surgeon may go in removing the normal tissue adjacent to the tumor, and further therapeutic progress must depend upon other methods. The only other method of treatment of malignant tumors, which though local in its character is capable of improving the results of surgery, is *radiotherapy* or treatment with roentgen rays and the rays of the radioactive substances.

The rationale of radiotherapy in malignant tumors must be looked for in the so-called *selective* action of the rays on the cancer cell. The roentgen rays and the rays of the radioactive substances are absorbed by the cells of the radiated tissue. Through the biochemical action of the rays, the cells become diseased. The injury caused in the cells by the radiation may differ in degree in accordance with the quantity of the rays absorbed. Cells only slightly injured may recover while a severer injury may completely destroy the cell. Every cell of the animal or plant organism is susceptible

to injurious action of the radiations. But the susceptibility varies in degree with the cells of different tissues. The cells of malignant tumors are a great deal more susceptible to the action of the rays than the cells of the normal tissues surrounding the tumor. If the rays are employed of a correct quality and in a sufficient quantity, it is possible to destroy all the cancer cells in a certain locality, and at the same time leave the normal tissues either intact or so slightly injured that they ultimately completely recover. In a recent report of cases in which radiotherapy was employed by the writer, 7.5 per cent. of clinical cure was obtained in completely inoperable cases. Moreover, several cases, which did not seem to have been improved clinically under treatment, showed morphological changes in the tumors, which strikingly indicate the value of radiotherapy in the treatment of malignant tumors. The writer further compared his own results with nearly 1,000 cases of inoperable malignant tumors treated by radiotherapy by other investigators, and found 6.6 per cent. clinically cured cases. The writer succeeded also in demonstrating that the rays may destroy cancer cells at considerable distance from the source of the rays. But only the hardest rays can reach at that distance. They again represent a small fraction of the whole beam of rays and their action diminishes in the inverse ratio to the square of the distance. Consequently the further the distance of the tumor from the surface of the body, the smaller its size must be in order to be destroyed by the rays. Minute metastatic nodules can be destroyed by the aid of radiotherapy at a great distance from the surface of the body, while a large tumor situated near the skin may be only partially destroyed. This observation shows the actual rationale of radiotherapy in the treatment of malignant tumors and its relation to surgical treatment. Both surgery and radiotherapy are local methods of treatment. Success in cancer therapy depends upon the destruction of all the cancer tissue in the organism. The advantage of surgery consists in the fact that it removes immediately at one sitting everything diseased. On the other hand, it removes with it at the same time a great deal of adjacent healthy tissue. A limit is set to this removal of normal tissue by the fact that vital organs may be injured and consequently the life of the patient endangered. As a result of this a large percentage of cancer patients, as stated above, are inoperable and in a great many of those operated upon there are left microscopical islands of cancer tissue, no matter how radical the operation. These small islands develop subsequently into secondary tumors, and the disease recurs. The main advantage of radiotherapy, on the other hand, consists in the fact that it may destroy such small islands of cancer tissue without injuring the adjacent normal tissue. The disadvantage of radiotherapy consists in the fact that while it de-

stroys the upper layers of a large tumor, the lower part may continue to grow.

The great advantage of the combined treatment thus becomes obvious. Surgery must remove the gross tumor whenever possible and radiotherapy destroys the small islands of cancer tissue which cannot be seen by the naked eye of the operator and which are left behind in the greater number of cases notwithstanding the most radical operation. In other words, the treatment of a cancer patient is not complete unless the operation is followed for a certain length of time by radiotherapy. Cases considered to be inoperable, *i. e.*, those in which all the cancer tissue cannot be removed and a radical operation cannot be performed, should be operated upon with the aim in view to remove the greatest mass of the cancer tissue. This should be followed by radiotherapy in order to destroy the small disseminated remnants of cancer tissue. Since such small islands of tumor tissue may be left even after a most radical operation, it is self-evident that every operated case should receive prophylactic treatment by radiotherapy.

#### THE NEED OF A CANCER SERVICE IN A LARGE HOSPITAL.

The brief review presented above shows that no revolutionary discovery can be recorded either in the matter of etiology or specific diagnosis or therapy of malignant tumors. None the less, a great deal of progress has taken place in the last fifteen years in all these subjects. The clinical handling of cancer patients is becoming more gratifying and not as hopeless as heretofore. On the other hand, the work is becoming more complex and varied. A correct co-ordination of the pathology, the clinical and serodiagnosis, the surgical treatment and radiotherapy and the clinical research is indispensable both to the present welfare of the *cancer patients* and the future progress in the *cancer problem* as a whole. This work can be pursued to the best advantage in a *cancer service* of a large general hospital. Indeed, such a department offers in a way better opportunities for scientific clinical investigation than a special cancer hospital. To the advantage of the concentration of clinical material and the presence of special laboratory facilities of the latter, the former has the additional advantage of the cooperation of all the other clinical and laboratory divisions of a large hospital. In view of all this, and the further fact that at least 75 per cent. of all cancer patients sooner or later enter into the inoperable stage and become an intolerable burden to their families, it is imperative that large hospitals should establish *cancer services*. In such a service the patients should be kept either for the remainder of their life or until they improve sufficiently not to be a burden to their families. This does not imply, as a rule, years of treatment, and can be



accomplished in a hospital and not only in a home for chronic invalids. The creation of such departments will not only be conducive to the better, more efficient treatment of cancer patients, but, what is of the greatest importance, it will create a class of medical men who will take up clinical cancer research as a life study. Since a cancer service in a large hospital will give these men the opportunity of combining the study of pathology and surgery of the disease with the experimental research in methods of specific diagnosis and therapy, their work will be followed by true progress in the *cancer problem*.

## THE INFLUENCE OF HEREDITY UPON THE OCCURRENCE OF SPONTANEOUS CANCER.

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There are two great points at issue in the determination of the inheritability of cancer: (1) The cure of the race, for if cancer is hereditary in the strict sense, it can be eliminated; (2) the cure of the individual, since any knowledge of the nature of cancer must give us a more enlightened point of attack in the search for a remedy.

In reporting my results in the study of this question, I have used and shall continue to use the expression "inheritability of cancer" although cancer is not transmitted as such. When we speak of albinism, or of heavy pigmentation or of any other similar character as being inheritable, we mean that in the germ plasm resides the power received from its progenitors and transmitted in turn to its posterity, to produce an individual devoid of pigment, or heavily pigmented, etc.

Just so in speaking of cancer as inherited, we mean that in the germ plasm resides the power received from its progenitors and transmitted in turn to its posterity, to produce an individual whose tissues under a given provocation shall proliferate in the structureless and wild manner of malignant growth.

In studying any question of inheritance certain facts of biology must be kept in mind. When the egg cells and the sperm cells are laid down, there is already determined in them the germ plasm of the succeeding generation. In collecting human statistics on cancer, therefore, it must be remembered that the offspring of two individuals is not merely a compound of these two, with emphasis perhaps upon the characters of the one or the other. Behind each parent lay a long descent of determining ancestry, and since mating in the human species has always been heterogeneous, every individual is an intricate complex of what he can transmit to his immediate offspring in any hybrid cross. It follows, therefore, that the characters carried by the mate shall in every instance determine which of the potentialities of any individual shall be transmitted in any given cross.

For example, if a first generation albino mouse derived from red is mated with another albino it will produce only albinos; if this same albino mouse from red is mated with a grey it will produce red mice in its immediate offspring. The mating of this albino mouse with grey determined the production of red offspring. It is in such facts as these—namely, that the mate determines which of one's almost infinite number of potentialities shall be transmitted, that the profound demand of eugenics lies.

This long continued process of mixed hybridization in the human race, together with its slow evolvment of generations and the paucity of accurate ancestral records on any inheritable character

whatever, makes a problem very difficult if not impossible of analysis. This difficulty of analysis does not influence the operation of the laws of heredity in the human species as well as in any other.

Since accurate data are not obtainable for the study of the inheritance of cancer in the human species, I took as the basis of my experiments a pedigreed stock of some five thousand mice secured during four years of previous study of general problems in heredity. The cancer structures in mice are identical with cancer structures in man, and they behave in the same way. Other diseases common to man have close analogies or absolute parallels in mice; large numbers of mice can be kept in a comparatively small space; generations can be made to succeed one another rapidly, and external conditions can be carefully controlled. Mice furnish, therefore, an admirable material for the study of spontaneous cancer, both in the matter of the inheritability and of the behavior of cancer in its occurrence and in its clinical course.

On the minutiae of the behavior of characters in heredity there is considerable difference of opinion, but certain fundamental facts admit of no dispute. Let me recall some of these fundamental facts.

I. If a pure-bred house-mouse (grey) is crossed with a pure-bred albino (white), the first filial generation will all be grey. If, however, these greys are bred out, three types of mice will result: (1) Pure breeding house-mice (heterozygotes); (2) pure breeding albinos; (3) mixed greys, which if inbred will yield the same three types in about the proportion of one pure grey to one pure albino to two mixed greys.

II. If a pure bred albino is mated with a mixed grey (heterozygote) their immediate offspring will include albinos and heterozygous greys in about equal ratio. These albinos will breed true, and again, the heterozygotes, if inbred, will yield the same three types of mice, pure breeding house-mice, pure breeding albinos, and heterozygous greys.

In testing for the inheritability of any character, it is necessary first, to inbreed individuals who express this character in themselves. If the character is transmitted through one generation after another to all the offspring, it is proved to be an inheritable one. For example, if house-mice are mated they will transmit through generation after generation probably to every individual, the house-mouse type of coat, grey in color, allowing, of course, for the limited variation to be found in every species. Or, if albinos are mated they will transmit albinism to every member of the strain through generation after generation.

The inheritability of cancer, however, cannot be determined by the inbreeding test alone, because it does not appear early in any species in which it is common, and individuals have many years in the human species, or many months or even years in the mouse species, during which they may be swept off by accident or by other diseases before the cancer age arrives. During all this time they may have been potentially cancerous and capable of transmitting cancer to the offspring, but this fact would not be apparent at the time of their death.

It is necessary, therefore, in studying the inheritability of cancer to use also the hybridization test. For example, as already pointed



out, if a pure-bred albino is mated with a pure-bred house-mouse albinism will appear in the second hybrid generation, and by the right mating in every generation thereafter; so that from such a cross, one can extract lines of pure-breeding albinos which will behave in every test exactly like pure-bred albinos not subjected to this hybrid cross. That is, albinism stands the second test of inheritability—namely, barring accidents, it is carried into every strain with which it is hybridized.

It is necessary to apply this hybridization test to such a character as cancer. Having by inbreeding, established cancer-bearing strains, one must hybridize both the individuals that show cancer, and those that die from other causes without showing cancer. If both the individuals that express cancer and those that do not still carry it into the strains with which they are hybridized with the certainty of albinism, and if from such hybrid crosses one can extract lines of cancer-bearing individuals that breed true and in turn carry cancer into strains with which they are hybridized, and also of non-cancer-bearing individuals, the inheritability of cancer is proved beyond a doubt, provided at the same time that all possible control tests have been carried on to demonstrate that cancer cannot be contracted by contagion.

In testing the matter of contagion of cancer, I have carried on through years the following experiments:—

1. House-mice and other mice of proved non-tumorous strains are kept in the same cage with cancerous mice.

2. When a cancerous mouse dies, non-tumorous mice are given the soiled cage in which the cancerous mouse has died, with all the debris and old food soiled by the dead mouse.

3. The young of carcinomatous mothers are fed and reared by non-tumorous mothers; and the young of non-tumorous mothers are fed and reared by cancerous mothers. I have never had a case of contagion in any of these tests.

4. Over and over again the cancers of mice have been eaten by their mates or by mice placed with them as controls.

5. Portions of the cancer and of the viscera of dead cancerous mice have been fed systematically to mice in control cages. I have never had a case of cancer in such mates or in such controls.

All materials used in the work—cages, boxes, dishes—are kept as nearly as possible sterile. Materials used for cancerous mice are not used for non-cancerous mice. The hands of all workers are sterilized before passing from tumorous to non-tumorous stocks.

These contagion tests show that cancer is no more contracted by contact than albinism is, and contagion is therefore ruled out as a factor in the transmission of cancer.

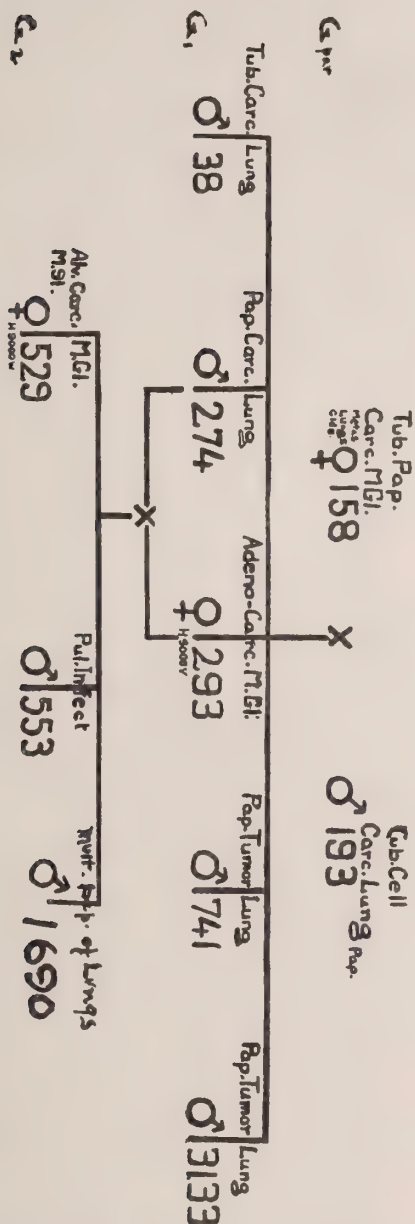
The results\* reported in this paper are the outcome of hybridizing a highly cancerous, closely inbred strain of albino mice with (1) other highly cancerous strains, (2) slightly cancerous strains, (3) non-cancerous strains. I took as the basis of these experiments Strain 139, already reported on.\*\* This is a strain of albino mice closely inbred for twenty-five generations. The individuals represented in the chart are all that were left of this family when these

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\*Reported before the American Society for Cancer Research, Toronto, April, 1914, and before the American Medical Association, Atlantic City, June, 1914. Published, *Jour. Med. Research*, March, 1915.

\*\**Jour. Med. Research*, July, 1914, Vol. 30.

CHART I.  
STRAIN 139



experiments began. With the exception of Male No. 553, every mouse showed tumor at autopsy, all but one being malignant tumors. This male, No. 553, was barely six months old when he was carried off by a pulmonary infection.

Taking the conservative point of view and calling this mouse non-cancerous, the strain shows ninety per cent. of cancer.

Assuming that male No. 553 would have developed lung tumor, this chart is the exact parallel of the results that would be obtained by mating one albino with another. Nothing but albinos could be produced from such a mating. That is, the tendency to

Parent	♀-Strain	139.	Parent	♂-Strain	90.
Parent	♀-Strain	139.	Parent	♂-Strain	90.

Strain 65

G. Parent

Q.1

Parent	♀-Strain	139.
1	2	3
4	5	6
7	8	9
10	11	12
13	14	15
16	17	18
19	20	21
22	23	24
25	26	27
28	29	30
31	32	33
34	35	36
37	38	39
40	41	42
43	44	45
46	47	48
49	50	51
52	53	54
55	56	57
58	59	60
61	62	63
64	65	66
67	68	69
70	71	72
73	74	75
76	77	78
79	80	81
82	83	84
85	86	87
88	89	90
91	92	93
94	95	96
97	98	99
100	101	102
103	104	105
106	107	108
109	110	111
112	113	114
115	116	117
118	119	120
121	122	123
124	125	126
127	128	129
130	131	132
133	134	135
136	137	138
139	140	141
142	143	144
145	146	147
148	149	150
151	152	153
154	155	156
157	158	159
160	161	162
163	164	165
166	167	168
169	170	171
172	173	174
175	176	177
178	179	180
181	182	183
184	185	186
187	188	189
190	191	192
193	194	195
196	197	198
199	200	201
202	203	204
205	206	207
208	209	210
211	212	213
214	215	216
217	218	219
220	221	222
223	224	225
226	227	228
229	230	231
232	233	234
235	236	237
238	239	240
241	242	243
244	245	246
247	248	249
250	251	252
253	254	255
256	257	258
259	260	261
262	263	264
265	266	267
268	269	270
271	272	273
274	275	276
277	278	279
280	281	282
283	284	285
286	287	288
289	290	291
292	293	294
295	296	297
298	299	300
301	302	303
304	305	306
307	308	309
310	311	312
313	314	315
316	317	318
319	320	321
322	323	324
325	326	327
328	329	330
331	332	333
334	335	336
337	338	339
340	341	342
343	344	345
346	347	348
349	350	351
352	353	354
355	356	357
358	359	360
361	362	363
364	365	366
36		

Parent  $\delta$ -Strain 90.

6 Parent.

61

5.8

6.2.2

٢١

6.3

64

G.A

This Strain shows about 27 % of Cancer.

1000



CHART 3.

Strain 146

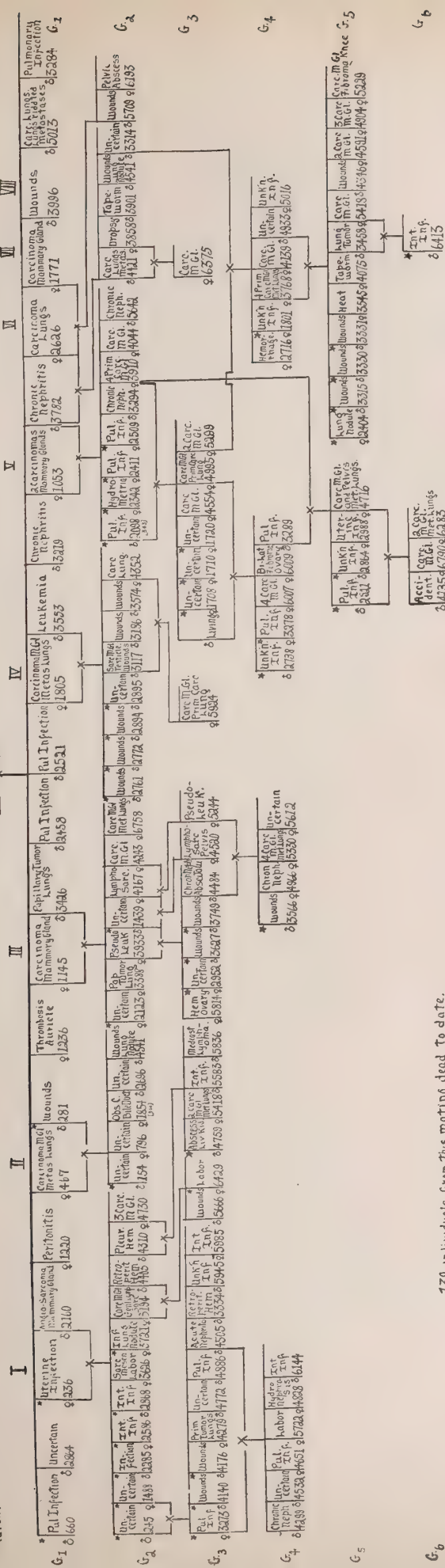
A Hybrid Strain of Albinos

♀ 529 - Both grand-parents and both parents had Cancer.

♂ 242 - Came of Cancer family

Parent

Parent



139 individuals, from this mating, dead to date.

42 died before Cancer age.

42 unquestioned cases of Tumor nearly all malignant.

3 Lung Nodules not yet definitely tumor

3 cases of Leukemia and Pseudo-Leukemia.

The strain shows nearly 43% of Cancer

★ Died before Cancer Age.

develop cancer is behaving like any Mendelian recessive, such as albinism or the whirling habit of the Japanese dancing mouse. The chart is here repeated for convenience in identification.

Strain 139 was first hybridized with Strain 90, a slightly tumorous strain of inbred grey-white piebald mice, carrying a low per cent. of cancer. This cross produced Strain 65, an extracted strain of grey-white piebald mice.

The female progenitor of this strain, female number 293 appears in the first filial generation in Strain 139 (Chart 1). Both her parents had carcinoma and she herself had carcinoma of the mammary gland. Her four brothers had tumors of the lungs, all but one malignant. In Strain 139, when mated with her brother, No. 274, with carcinoma of the lung, she produced young, all but one of which had cancer. (This one died when barely six months old). This female therefore evidently was an extracted recessive, as regards the tendency to form cancer.

After this mating with her brother she was hybridized with male No. 25 to form Strain 65. Male No. 25 coming from a strain showing a low per cent. of cancer, evidently carried cancer potentially, for in the first hybrid generation of this cross cancer appears in the ratio of 2:3.

This first generation was bred out in two branches, both of which, with the parent female cancerous, have continued to show cancer in all succeeding generations. In Branch 1 a line is being extracted which shows no tumor (shown at the left of the chart).

Strain 65 shows to date about twenty-seven per cent. of cancer. The albino strain extracted from this cross also shows a considerable percentage of cancer.

Strain 139 was next hybridized with Strain 151 which carried a fair per cent. of cancer. This cross produced Strain 146 which has already been published with the description.

Strain 146 carried about forty-three per cent. of cancer. The chart is here repeated for reference. This strain has been bred out in eight branches.

For convenience in analyzing the results in Strain 146 I have charted out three branches of the family—namely, Branches I, III, and V, and have lined them up with typical Mendelian results as shown in Charts 4 to 9 inclusive.

Chart 4 starts with the original parents of Strain 146, female No. 529 and male No. 242. For this branch of the family in the first filial generation, female No. 236 without cancer was mated with male No. 2160 with angiosarcoma of the mammary gland. The selection for the matings in the second filial generation were female No. 1488 and male No. 215, both without cancer. By this selection cancer apparently has been eliminated from this branch of the family, for although this branch is now living in the laboratory up to the eighth generation, no cancer has as yet appeared.

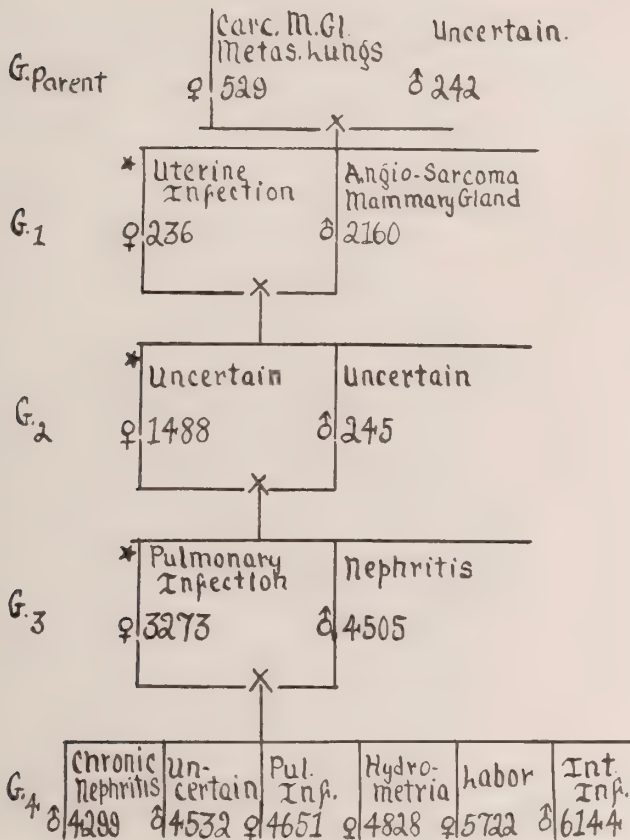
The results here are exactly parallel to a cross between an albino female and a heterozygous grey male. If in the first filial generation there is selected a heterozygous grey female and an albino male and in the second filial generation both parents selected are heterozygous grey, by the selection of two dominant greys in the third generation we produce thereafter only dominant greys, and albinism is thus eliminated.

This branch of the family is apparently a heterozygous line producing in each generation some cancerous and some non-cancerous individuals. This is parallel with the results which would be obtained by the continued mating of an albino with a heterozygous grey through successive generations: each generation would yield some albinos and some heterozygous greys.

In Branch III we have practically an extracted line of cancerous mice. By the selection in the first filial generation of parents, both of which had cancer, through the succeeding two generations

CHART 4.

Strain 146 I



cancer appears in every individual except male No. 1439 in generation two, who died long before tumor age. This is exactly parallel to the results which would follow from the cross of an albino and a heterozygous grey if in the first filial generation we selected albino parents. From that generation on, only albinos could be produced by inbreeding, and the result would be an extracted strain of albinos.

In Branch III of Strain 146 the line is evidently an extracted line of cancerous mice.



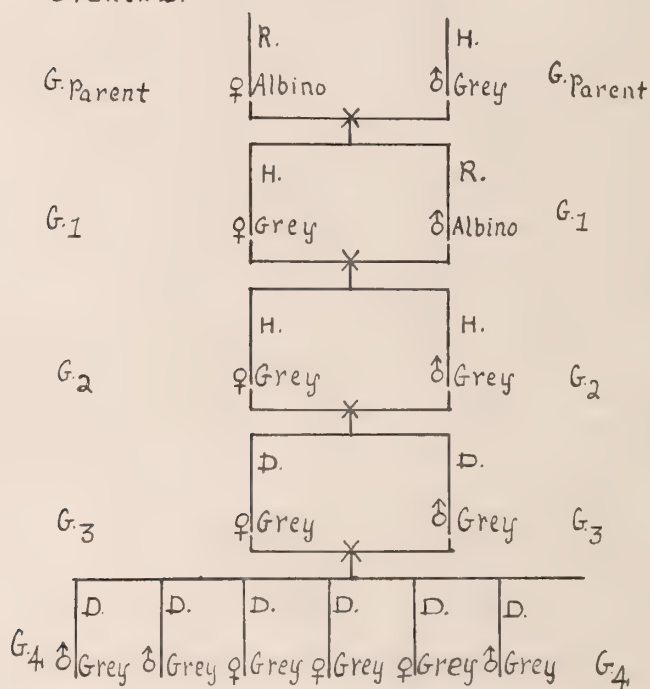
In these three branches of Strain 146 the results show, (1) an extracted line of non-cancerous mice (Branch I); (2) an extracted heterozygous branch, producing some cancerous and some non-cancerous mice (Branch V); and (3) what so far is an extracted line of cancerous mice (Branch III).

I am including the leukemias and the pseudo-leukemias with cancer in my statements regarding Branch III of Strain 146.

### CHART 5.

Mendelian Chart showing results in color inheritance parallel to cancer inheritance in Strain 146

Branch I.



An extracted strain of pure Greys from a hybrid cross between an albino female and a heterozygous grey male.

Throughout my entire work the leukemias and pseudo-leukemias have fallen almost wholly within proved cancer strains. Leukemic individuals have transmitted cancer with the same certainty as carcinomatous individuals in the cancer strains, and the age incidence of leukemia is closely parallel with that of carcinoma. I have never had a leukemic case under eight months of age. No one so far has been able to infect with mouse leukemia.

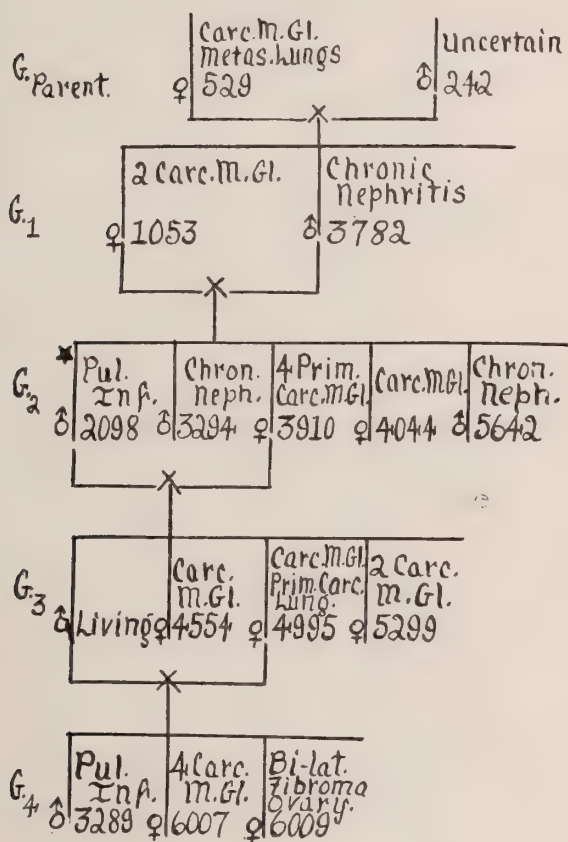
One fact should be emphasized here. Although the ancestral

strain on one side of Strain 146 carried probably one hundred per cent. of cancer and on the other side of the cross a fair percentage of cancer existed, yet by the proper selection of non-cancerous individuals, cancer has been eliminated from one branch of the strain. This branch now runs into the eighth generation without the appearance of cancer.

The rest of the charts in this report show the results of crossing Strain 146 with (1) other highly cancerous strains; (2) with fairly and slightly cancerous strains; (3) with non-cancerous strains.

## CHART 6.

## Strain 146 V



Strain 304 is a hybrid strain the result of crossing female No. 1854 (Chart 3, Branch II, G<sub>2</sub>) whose death cause was obstruction of the common bile duct, with Male No. 1080, who died of an unknown infection. Apparently both of these parent mice carried cancer potentially though neither expressed it; for it appears in the first filial generation in almost Mendelian ratio. In Branch I of this strain cancer evidently is eliminated. In Branch II it appears in low percentage and in Branch III, where both parents were cancerous, female 5844 and male 5162, every one of the offspring

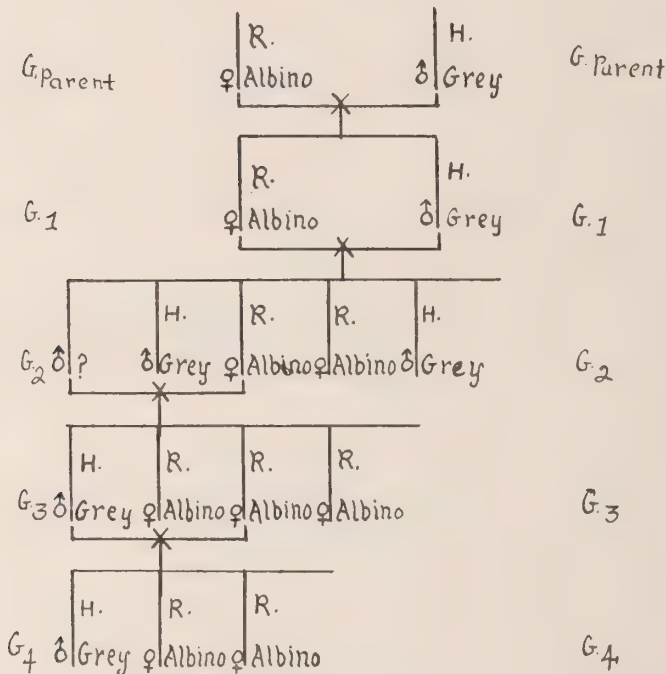
that lived to cancer age died of cancer. In this chart also the results are closely parallel to typical Mendelian results, viz., an extracted line in which no cancer appears, a heterozygous branch, and an extracted branch of cancerous mice. The entire strain shows about twenty-two per cent. of cancer.

Strain 343 represents a cross between two individuals each of highly cancerous ancestry. The female had cancer, the male died

### CHART 7.

Mendelian Chart showing results in color inheritance parallel to cancer inheritance in

Branch I Strain 146



A heterozygous strain (showing some albino and some grey) from a hybrid cross between an albino female and a heterozygous grey male.

before cancer age of a pulmonary infection (Male 2098 appears in Branch V of Strain 146 G<sub>2</sub>).

Apparently in this hybrid cross the male carried cancer, for in the first filial generation cancer appears in about fifty per cent. In the succeeding generation, there is a branch without cancer, a heterozygous line, and an extracted line of cancer.



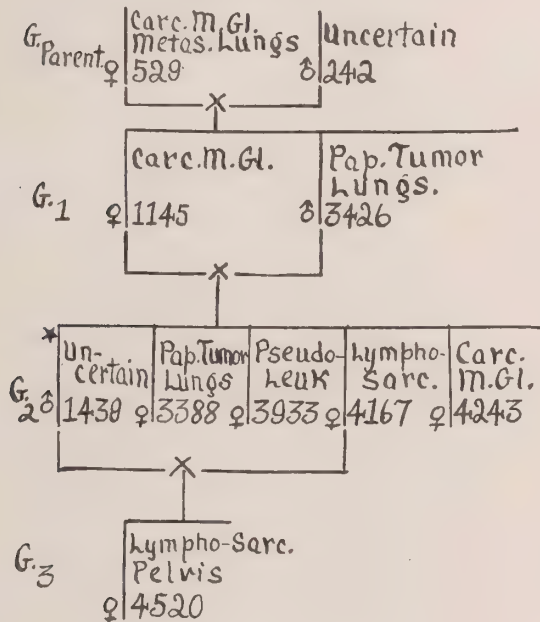
The entire strain shows about fifty-eight per cent. of cancer. This is a strain which is nearly extinct. The succeeding chart shows the cancer ancestry which lay behind the male progenitor of Strain 343, viz., Male No. 2098, who died before cancer age of an acute pulmonary infection, and who appears in Chart 3, Strain 146, Branch V, G<sub>2</sub>.

Going back to the original progenitors of Strain 139 (Chart 1) female No. 158 and male No. 193, both with cancer, produced female No. 293 (maternal parent of hybrid strain 65). This female mated with her brother, No. 274, also cancerous, produced female No. 529, the cancerous maternal parent of hybrid Strain 146.

CHART 8.

Strain 146

III



Female No. 529 mated with male No. 242 who came in from Strain 151 carrying a low per cent. of cancer, produced female No. 1053 with two carcinomas of the mammary gland, and male No. 3782, with chronic nephritis. This mating produced Branch V of Strain 146 and their son, male No. 2098, was the male parent of Strain 343.

This chart shows four straight generations of cancer behind male No. 2098, two of them being double cancerous ancestry.

The resulting hybrid Strain 343 is a nearly extinct strain, highly cancerous, the cancerous members of which are riddled with malignant growths.

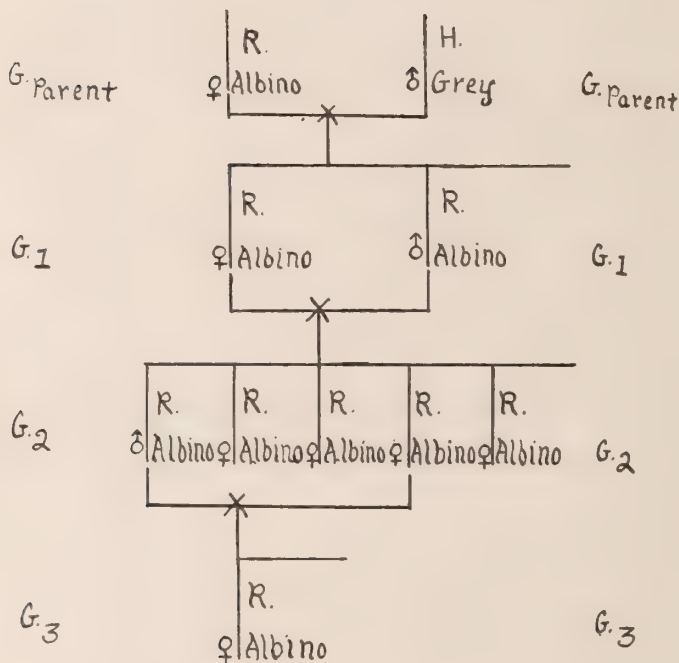
This strain represents a cross between female No. 5924 with primary carcinoma of the mammary gland and primary carcinoma of the lungs, and male No. 5183 who died of hypertrophied heart and acute intestinal infection. The female appears in Chart 3,

## CHART 9.

Mendelian Chart showing results in  
color inheritance parallel to cancer inheritance in

Strain 146

## Branch III



An extracted strain of albinos from a hybrid cross between an albino female and a heterozygous grey male.

Strain 146, Branch IV, G.<sub>1</sub>. The parent male came from Strain 85 carrying a low per cent. of cancer. The first filial generation shows four cases of carcinoma, one of pseudo-leukemia, and three non-cancerous cases, one of which died before cancer age. The cancerous mice in every case were riddled with malignant growths. This is another strain that is dying out. There remains one male of the first hybrid generation, one female of the second hybrid generation, and some young mice of the third generation.

The strain shows about fifty-five per cent. of cancer.

This chart shows the cancer ancestry behind female No. 5924,

# CHART 10.

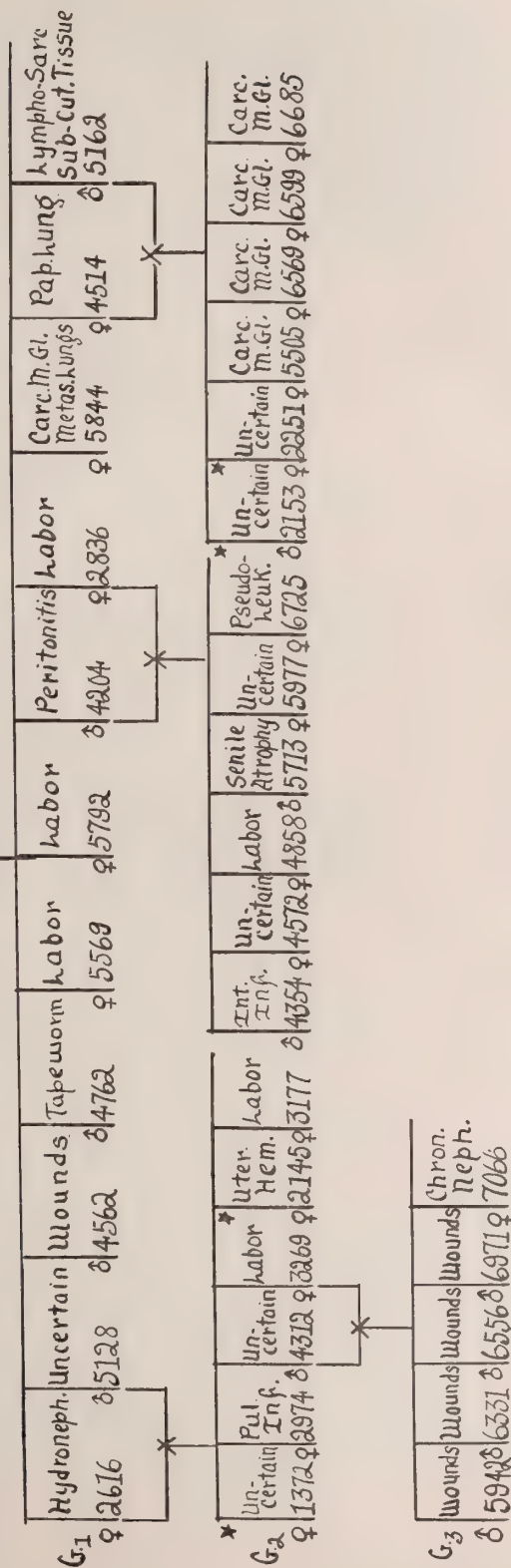
## Strain 304

Parent ♀ - Strain 146 II

Parent ♂ - Strain 41

G-Parent

G-Parent



This Strain shows about 22% of Cancer.

L.H. Anderson



the maternal parent of Strain 450, going back to the progenitors of Strain 139, both with cancer, female No. 158 and male No. 193.

In the first filial generation the mating was between female No. 293 (the female progenitor of hybrid Strain 65), and male No. 274 both with cancer.

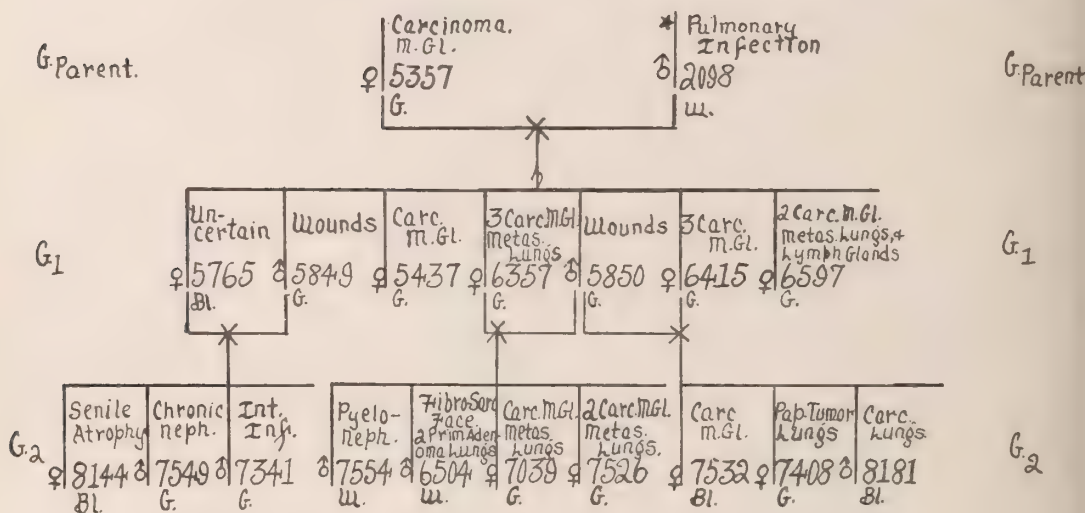
Their daughter, female No. 529, with cancer, was mated with male No. 242, who came in from Strain 151 carrying a fair percentage of cancer. This mating produced Strain 146; female No. 1805 with cancer, and male No. 3553, with leukemia, forming the beginning of Branch IV, Strain 146. The mating of their daughter,

### CHART 11.

### Strain 343

Parent ♀ - Strain 21

Parent ♂ - Strain 146-V.



*This Strain shows about 58% of Cancer.*

\*The letters beneath the figures in this chart indicate the color of the mouse. G=grey. Bl=black. W=white. They are given here to show that cancer does not follow color lines.

No. 4352, with carcinoma of the lungs, and their son, No. 3117, with sarcoma of the mammary gland and of the testicle, produced female No. 5924, the maternal head of hybrid Strain 450.

This ancestral chart shows six straight generations of cancer ancestry behind the female progenitor of Strain 450, being double cancerous ancestry in all cases but two, in each of which the male evidently carried cancer but did not express it. The result, Strain 450, is a nearly extinct strain, riddled with cancer; whose cancerous representatives are riddled with malignant growths.

My experience tends to show that as the cancerous ancestry behind a generation deepens, the individuals of that generation become more completely cancerous. Whereas, early in the cancer history of a strain there tend to be single primary growths, later in its history, multiple growths become more and more common.

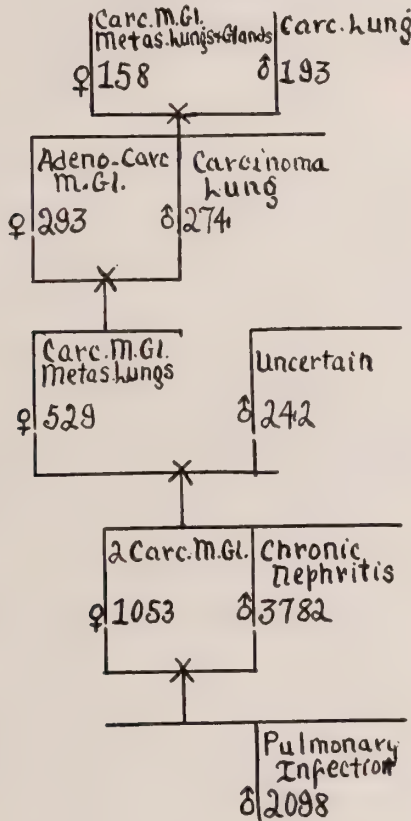
The latest product of a highly cancerous stock frequently has but few organs unaffected with malignant growths.

I have introduced the parentage charts behind one of the progenitors of each of these two strains, 343 and 450, in order to show how certainly the progenitors of these two hybrid strains had inherited cancer. The resulting hybrid offspring show how inevitably they transmitted it.

This strain represents a cross between female No. 4199, a hybrid

CHART 12.

Parentage 343



from a cross between a highly cancerous strain and a fairly cancerous strain, and male No. 4285 from a highly cancerous strain. Neither parent in this cross had cancer, both must have carried it, for the first filial generation shows nearly fifty per cent. of cancer.

This strain results from a double hybrid cross, each parent being the hybrid offspring of a highly tumorous with a fairly tumorous line. Though neither of the parents had cancer, both must have carried it, for fifty per cent. of their dead offspring shows cancer.

In these two strains, Nos. 443 and 413, neither parent had cancer. In both strains, however, the parents had inherited cancer

potentially and in both cases they inevitably transmitted it. It is noticeable also that the percentage of cancer in the first hybrid generation of these two strains is as high as if one of the immediate parents had cancer.

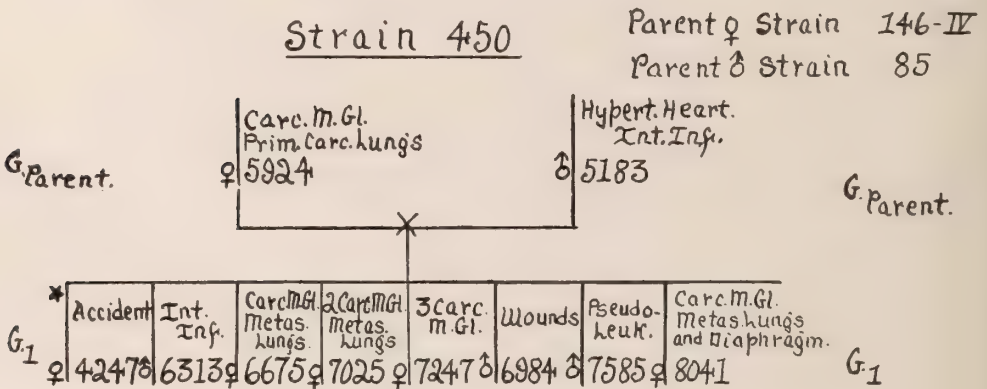
The succeeding four charts show the results of crossing the highly cancerous Strain 146 with a non-cancerous strain of house-mice.

In this strain, female 1236, an albino, first generation hybrid in Strain 146 (Chart 3) was mated with a house-mouse whose cause of death was uncertain. The parent female died of a thrombosed auricle.

Throughout this branch of the family, which is an extracted line of house-mice, no tumor has appeared.\* This branch of the family is represented in my laboratory to the fifth generation without tumor as yet. Evidently it is an extracted line of non-cancerous house-mice.

In branch two of this strain in the first filial generation a modi-

### CHART 13.



This Strain shows about 55% of Cancer.

fied grey-coated mouse was selected for the parent male. The branch splits in color, giving some white, some black, some house-mouse grey, and some modified grey. So far it has produced no tumors. This apparently is another extracted line of non-cancerous mice, heterozygous as to color.

For this branch of the strain two house-mice of the first filial generation were mated, neither of them having cancer, though both lived well into cancer age.

In the second hybrid generation sarcoma appears in the ratio of 2:5. In the third generation there has appeared one lung nodule. One line of this branch of the strain shows no tumor.

The entire strain shows about fifteen per cent. of cancer. This branch evidently includes an extracted line of cancerous house-mice.

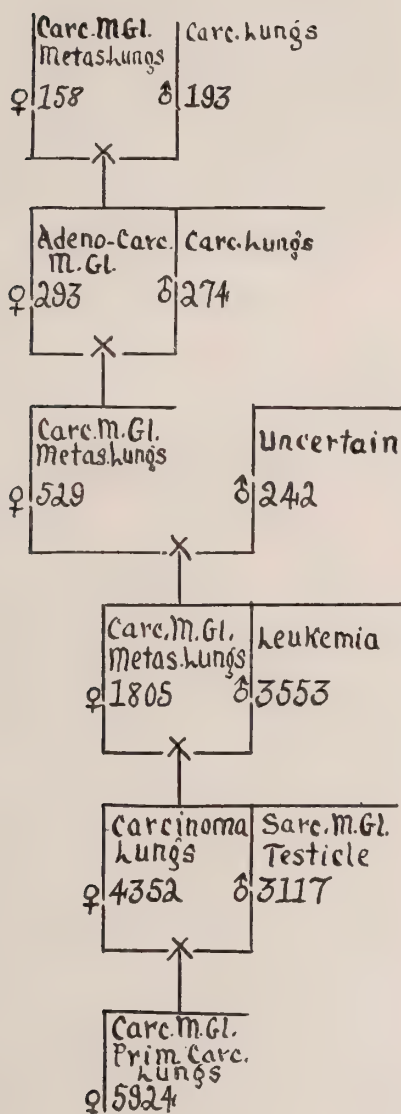
In Branch IV of this strain two mice of modified grey coat were

\*The capital letter under each number represents the coat color of the mouse. G=grey. W=albino. B=black. Bl blue. Blw blue-white. MG=modified grey.



CHART 14.

Parentage 450



chosen for the mating in the first filial generation: female No. 4338 and male No. 4378. Neither had cancer. In the second generation sarcoma appeared in the ratio of 3:7. (1) In this second generation female No. 6475 with chronic nephritis mated with male No. 5854 who died of lymphosarcoma of the thymus, gave in the third generation a female with two carcinomas of the mammary gland, and a male with chronic nephritis. (2) The mating of fe-

male No. 6629\* with two spindle-cell sarcomas of the face, with male No. 7470 who died of hypertrophy of the heart, has given two cases of carcinoma in their offspring, one male and one female, also a female who died in labor.

(3) The mating of female No. 6028 with male No. 6057, neither of which had cancer, has given no cancer among their offspring to date.

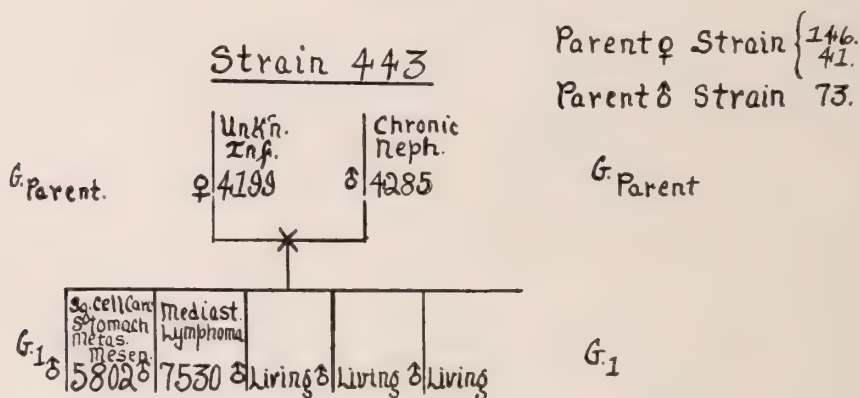
I am apparently getting in Branch IV two cancerous lines of mice, and one in which cancer does not appear.

This branch of the strain shows about twenty-four per cent. of cancer.

It splits as to color, giving some house-mice, some of modified grey, some white, some blue-white, and some blue. The cancerous lines in this branch of the family are blue-white and blue.

The crossing of this albino female from Strain 146, with a com-

### CHART 15.



This Strain shows 50% Cancer.

mon house-mouse showing no tumor in his strain, has yielded four branches:—

1. A non-tumorous line of house-mice.
2. A non-tumorous line of mice, heterozygous as to color.
3. A tumorous line of blue and blue-white mice.
4. A tumorous line of house-mice.

The inbred Strain 139, where double cancerous parentage was selected, gives only cancerous offspring.

In every case among the hybrid strains, where a high cancerous ancestry lay behind one of the parents and the parent female was cancerous, the strain shows from twenty-five to fifty-eight per cent. of cancer.

In the case of Strain 343, where both parents came of highly cancerous stock, the strain shows fifty-eight per cent. of cancer.

In every case where any degree of cancer entered on either side of a hybrid cross, the resulting strain shows some cancer.

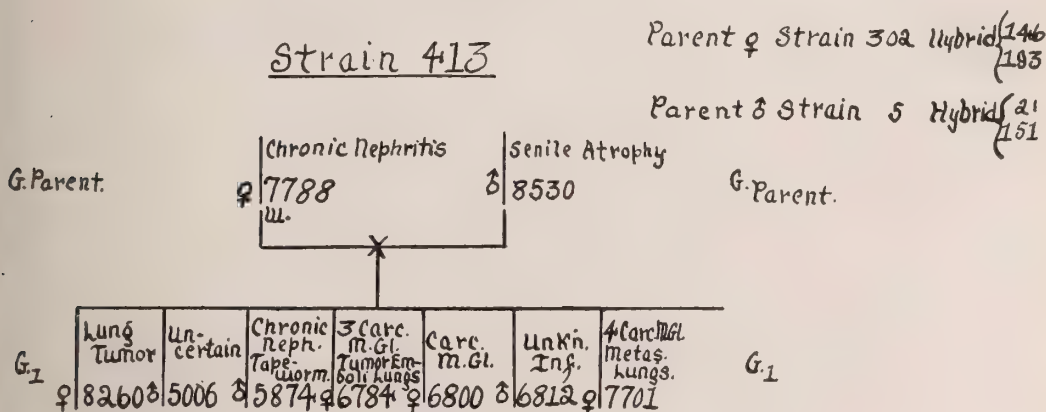
\*This female, No. 6629, was mated also in a hybrid cross where cancer is beginning to appear,

In cases such as Strains 413, 304, 327, 301, 164, etc., where neither parent was cancerous but where cancer was present in the ancestry, cancer comes out in every case in the progeny. The resulting hybrid strains range from eleven to forty-four per cent. of cancer, according to the selection of individuals mated.

In no strain throughout these experiments has cancer ever been bred in where it has not appeared in the progeny, if the mice have lived to cancer age.

The results obtained from this series of experiments show beyond a doubt that the tendency to produce neoplasms under the right provocation is transmitted from generation to generation with the inevitableness of the transmission of albinism. In this laboratory it has been carried through ten generations without a break. This transmission of cancer is not the exception but the rule. In a stock of living mice numbering at the present time over ten thousand,

CHART 16.



This Strain Shows 50% of Cancer.

there is a steady production of a nearly constant supply of cancerous individuals, falling almost without exception in the proved cancer strains.

Among over ten thousand autopsies, yielding over five hundred cases of spontaneous cancer in this laboratory, the cancers almost without exception have occurred in strains of cancerous ancestry and they have occurred in accordance with the laws of heredity governing the transmission of any other inheritable character.

The cancer-bearing representatives of such strains of mice carry cancer into a strain with which they are hybridized as inevitably as an albino mouse carries albinism into a pigmented strain with which it is hybridized and with parallel behavior of the character.

Having established cancer-bearing strains, it is possible to manipulate them as one manipulates strains of albino mice or of Japanese waltzing mice.

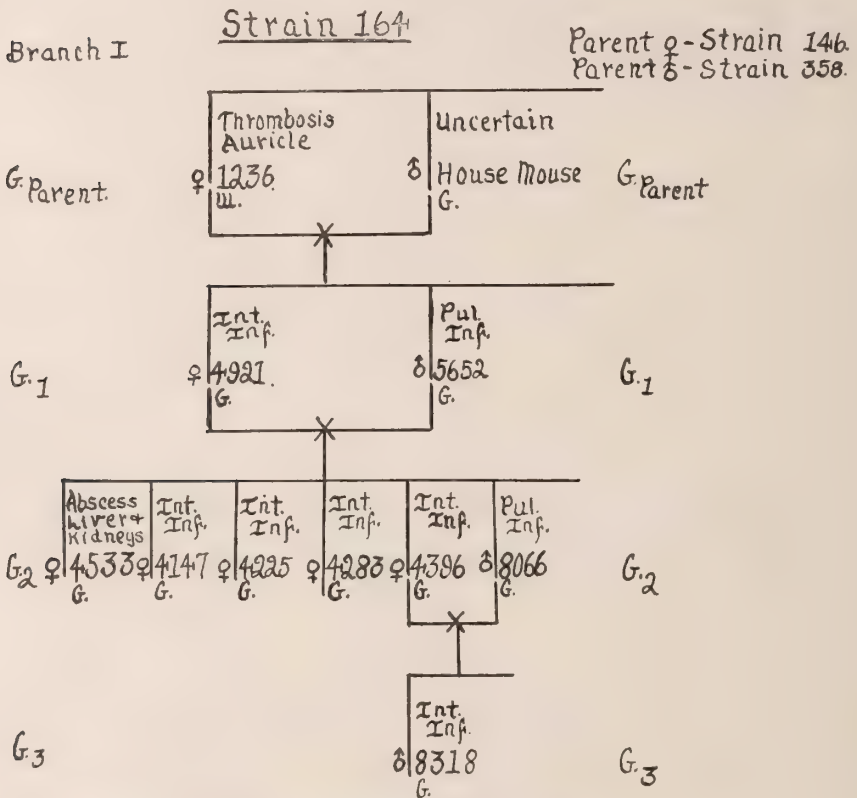
Some eight years ago I secured a strain of albino mice in which there appeared one individual, a male, with the whirling habit identical with the whirling habit of the Japanese waltzing mouse.



By selective breeding there has arisen in my laboratory a considerable strain of whirling albino mice with no Japanese waltzer blood behind them. By hybridizing these whirling albinos with strains of pigmented mice, I have secured extracted lines of whirling pigmented mice.

This original albino with the whirling habit was a member of Strain 139, the highly cancerous strain of closely inbred albinos, shown in Chart 1. Wherever this strain has been bred in, three

### CHART 17.



This branch of the Strain shows no Tumor.

Apparently an extracted Strain of non cancerous house mice.

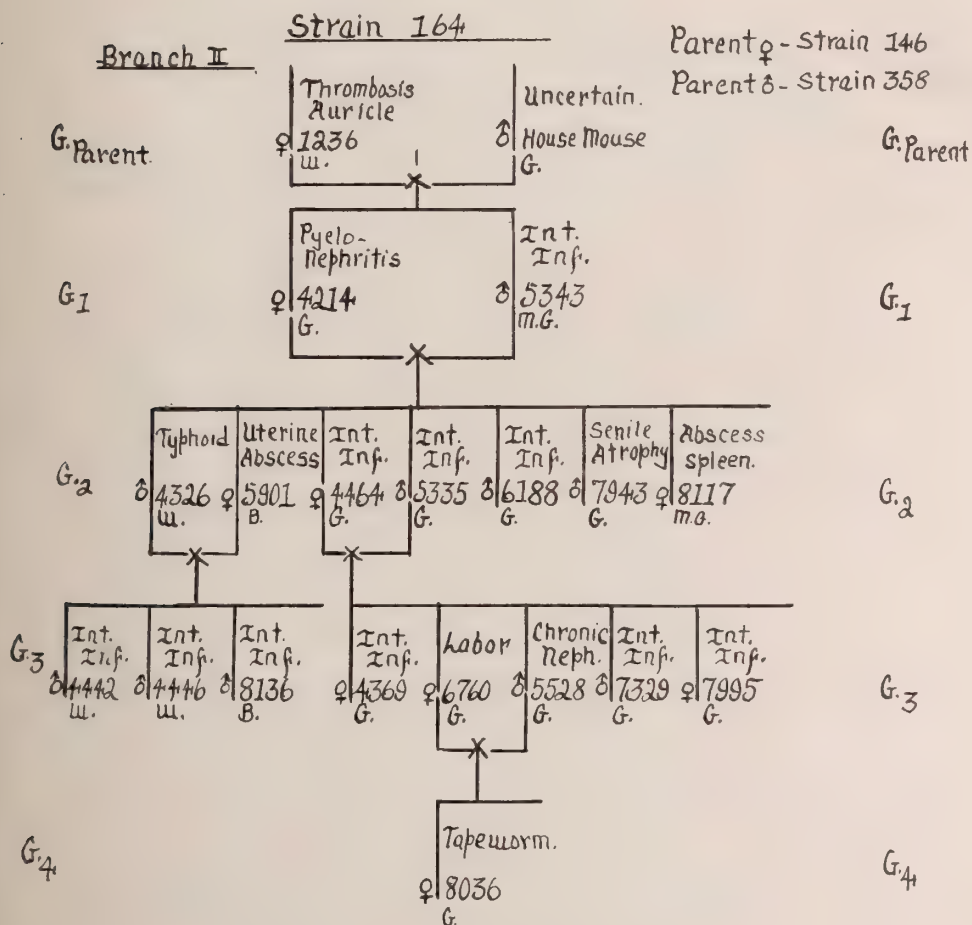
characters have come out, and they have appeared with equal certainty. The three characters are these: albinism, the whirling habit, and cancer.

One mouse, in this case, formed the basis of what is now a large community of whirling mice, whose relationship, if it were not a matter of record, would never be seen or suspected. In exactly this way one long-forgotten cancerous individual of the human species may form the basis of a whole cancerous community where through generations intermarriages have taken place between individuals originally derived from some branch of the same old stock and

bearing, like heterozygous mice, through one generation after another, the potentiality of cancer.

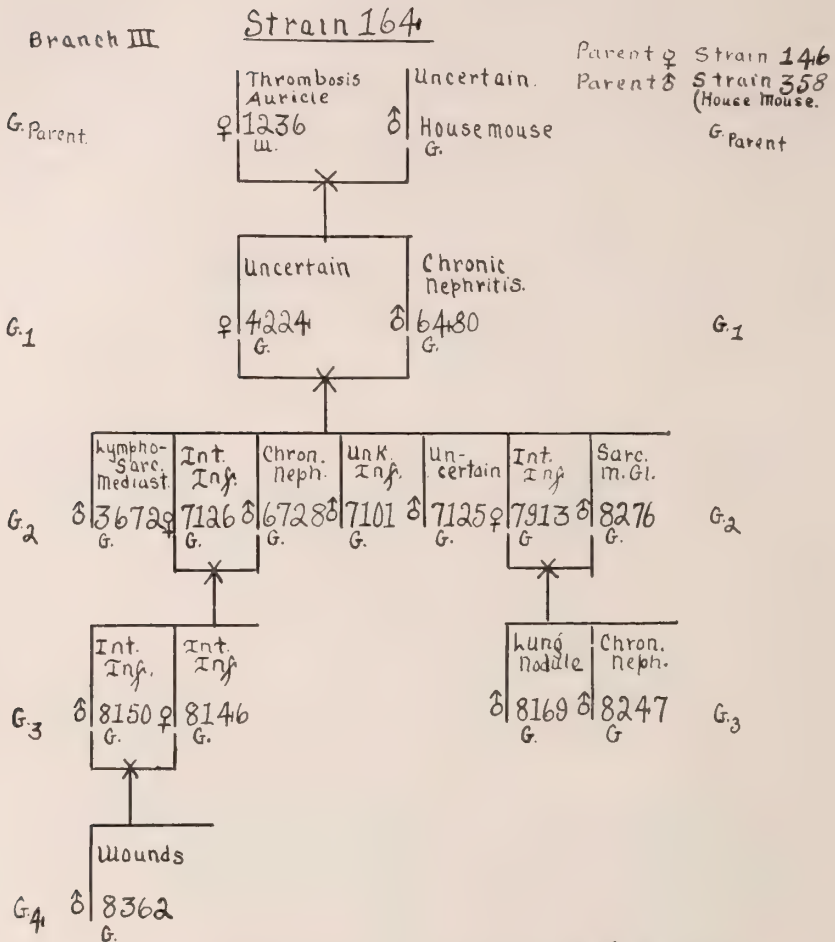
If a heterozygous grey mouse is mated with a pure-bred grey, no albinism will come out, though potentially it lies in the heterozygous grey; and in every generation from such mating potential albinism is transmitted to a portion of the offspring. This sort of mating might occur through several generations with no production of albinism, but when one of these heterozygotes finally mates with another heterozygote or with an albino, the albinism will come out in the immediate progeny. In just this way potential cancer might be handed along until eventually the right combination is made to bring it out. This has been done repeatedly in this laboratory. A 'cancer community' might be derived then by the mating of two

CHART 18.



This branch of the Strain shows no Tumor.  
It splits, however, with respect to color.

## CHART 19.



This branch shows nearly 15% of Cancer.  
Apparently an extracted line of House Mice,  
showing some Cancer.

individuals absolutely unrelated but both potentially bearing cancer, though neither actually develops it. Here the community might easily be at a loss to find the origin of the sudden outcropping of cancer which would appear in the immediate offspring from this union, and which would be carried into every family with which they mated.

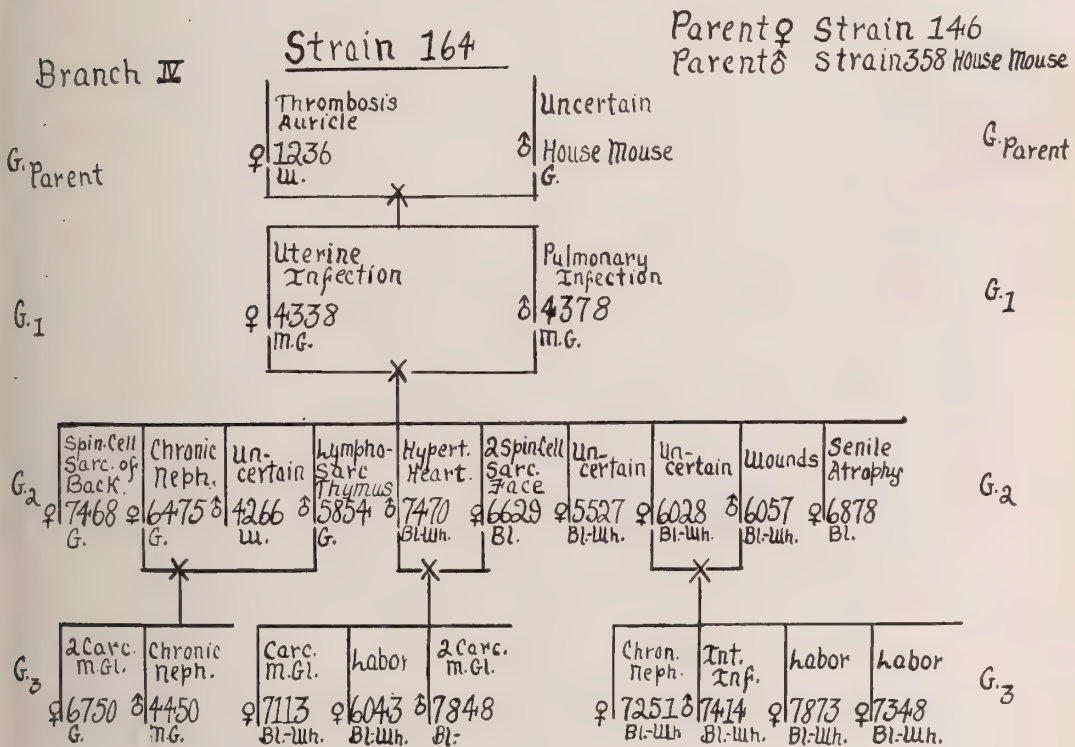
The whole problem of human heredity is obscured by the impossibility of getting the facts, but the laws of heredity operate with the same inevitableness as if the problem were simple and the data known.

It must be remembered also that inbreeding as such has nothing to do with the transmission of cancer. My strains of Japanese whirling mice have been closely inbred for twenty-one generations without the occurrence of cancer. All the non-tumorous strains in



this laboratory have been inbred in exactly the same way as the cancer strains; but the inbreeding has not introduced cancer. The method of the laboratory in deriving fixed strains must always be that of breeding out (that is 'inbreeding') the progeny from a hybrid cross. Only so can we definitely know what was derived from the hybridization. But in the transmission of albinism an albino from Strain 139 mated with an albino from Strain 92, with no relationship whatever, will just as certainly produce nothing but albinos as breeding in its own strain. And the mating of a heterozygote from such a cross with a wholly unrelated heterozygote from another cross with cancer behind it, will just as inevitably

CHART 20.



This branch of the Strain shows about 24% of Tumor.

In color it yields some house mice, some modified gray, some white, blue-white, and blue.

produce cancer in the immediate offspring as the mating of two heterozygotes from the same litter.

Just so, as shown in every hybrid chart in this report, the mating between cancer-bearing individuals derived from wholly different strains produced exactly the same transmission of cancer to the progeny as did the inbreeding of cancer strains.

Just what it is that is transmitted in cancer cannot be said. No more do we know just what it is that is transmitted in albinism or

CHART 21.

Strain	Inbred or Hybrid.	Type of Strain	Parents	Number Dead	Per Cent of Tumor.
139	Closely Inbred	Highly Cancerous	Both Cancerous	10 { 9 Cancerous. 1 non-cancerous	90%
146	Hybrid 139 x 151	Highly Cancerous Fairly Cancerous	♀ Cancerous	98 { 41 Cancerous 57 non- "	About 43%
413	Hybrid $\begin{smallmatrix} 146 \\ 193 \end{smallmatrix} \times \begin{smallmatrix} 21 \\ 151 \end{smallmatrix}$	H.C. } x { H.C. S.C. } S.C.	Neither Cancerous	9 { 4 Cancerous 5 non- "	About 44%
450	Hybrid 146 x 85	Highly Cancerous Slightly Cancerous	♀ Cancerous	7 { 4 Cancerous 3 non- "	About 57%
343	Hybrid 21 x 146	Highly Cancerous Highly Cancerous	♀ Cancerous	19 { 11 Cancerous 8 non- "	About 58%
304	Hybrid 146 x 41	Highly Cancerous Slightly Cancerous	Neither Cancerous	36 { 7 Cancerous 29 non- "	About 20%
327	Hybrid 146 x 145	Highly Cancerous Fairly Cancerous	Neither Cancerous	19 { 6 Cancerous 13 non- "	About 33%
302	Hybrid 146 x 193	Highly Cancerous Slightly Cancerous	♀ Cancerous	20 { 5 Cancerous 15 non- "	25%
8	Hybrid 146 x 10	Highly Cancerous Slightly Cancerous	Neither Cancerous	10 { 1 Cancerous 9 non- "	About 11%
301	Hybrid 47 x $\begin{smallmatrix} 146 \\ 193 \end{smallmatrix}$	Slightly Cancerous x { H.C. 7.C.	Neither Cancerous	10 { 2 Cancerous 8 non- "	About 20%
228	Hybrid $\begin{smallmatrix} 21 \\ 47 \end{smallmatrix} \times 146$	H.C. } x { Highly S.C. } Cancerous	Neither Cancerous	13 { 2 Cancerous 11 non- "	15%
65	Hybrid 139 x 90	Highly Cancerous Slightly Cancerous	♀ Cancerous	64 { 17 Cancerous 47 non- "	About 27%
164 Branch III	Hybrid 146 x 358	Highly Cancerous Non Cancerous	Neither Cancerous	16 { 2 Cancerous 14 non- "	About 15%
164 Branch II	Hybrid 146 x 358	Highly Cancerous Non Cancerous	Neither Cancerous	23 { 6 Cancerous 17 non- "	About 26%

in the whirling habit of the Japanese waltzing mouse, or in any other inheritable character. All we can say is that in the germ plasm there resides the potentiality or albinism, or of the whirling habit, or of cancer, which will eventuate in the individual developed from it.

What seems to be transmitted in cancer is the potentiality of the germ plasm to produce an individual whose tissues shall proliferate in the lawless fashion of the neoplasm, under a given provocation.

My observations in this laboratory tend to show that the provocation is over-irritation at the point where the cancer occurs. Forced breeding and suckling of young in a vigorous female of high cancer ancestry results in the location of cancer in mammary gland tissue and in the mammæ most constantly used. The same forced suckling in a female of non-cancerous strain produces no cancer. This has been tried over and over again with the same results.

Males with high cancer ancestry, isolated through long periods of their lives so that no breeding occurs, furnish 90 per cent. of the testicle tumors occurring in the Slys stock. The same isolating of males from non-tumorous strains produces enormously distended seminal vesicles usually accompanied by suppuration and general sepsis, but no tumors.

The isolation of groups of males who fight has repeatedly yielded a wounded individual whose tissues instead of regenerating normally, form neoplastic growths. It has never had this result in a mouse of non-tumorous strain. As has been said before, the numerous causes of irritation in the lungs of mice produce tumor in mice of cancerous strains and rarely do so in the non-cancerous strains.<sup>2</sup>

The overgrowth of an irregularly placed tooth or a broken tooth with the constant pressure upon adjacent tissues, or a wound in that region has accompanied every case of carcinoma of the jaw in this laboratory.

Wounds accidentally received from cage doors or by the improper handling of mice in the tumor strains have resulted repeatedly in the location of cancer at the point of the wound. It has never given a similar result in a non-tumorous strain.

The cancer structures in mice are identical with the cancer structures in man, and they behave in exactly the same way. The points at which they occur in mice are closely parallel to the points at which they occur in the human species.

There are, however, some notable differences in this latter respect. Mammary gland tumors are the most common in mice. They are highly common in man.

Lung tumors are second in frequency in mice. Until recently they have been supposed to be rare in man. The work of B. M. Edlavitch<sup>3</sup> is bringing the occurrence of lung tumors into closer agreement.

Ovarian and testicle tumors occur about as frequently in one species as in the other. So also do the kidney and the liver tumors, the mesenteric and the mediastinal.

There are four notable differences.

1. Tumors of the mouth and jaw are rare in mice. But there are just two causes of chronic disorder in the oral region of mice, viz., the overgrowth and consequent pressure of an irregularly placed tooth, or a wound caused by fighting, or by being hurt in the cage. Female No. 7618, of highly tumorous ancestry, was ac-



cidentally wounded in the mouth by the sharp edge of the cage door. She died of a squamous cell carcinoma at the point of the wound.

2. Tumors of the stomach are the most frequent of all tumors in man. In mice they are very rare. (Two of the three recorded cases of stomach tumor in mice have occurred in this stock.) But so also are chronic inflammatory conditions of the stomach common in man. Among over ten thousand autopsies of mice in this laboratory there have not been a half dozen cases of inflammatory conditions of the stomach. There has never been a case of tumor of the intestines in this laboratory. However, the intestinal disorders of mice are acute and carry them off within a few days—usually within a few hours after the appearance of any symptom of disorder.

3. There has never been a case of tumor of the uterus or of the prostate gland in this stock of mice, but neither are there any chronic disorders of these organs except hydrometria, which usually is of relatively short duration. I venture even in the face of opposition to suggest here that the perfect hygiene which controls the life of mice in this laboratory and which has controlled it for over eight years and through twenty-five to thirty generations in many strains, has much to do with the elimination of numerous causes of chronic irritation very prevalent in the human species. And I venture to predict that the similar elimination of chronic causes of irritation in the human species would inevitably reduce the frequency of cancer, particularly where there is a high degree of cancer ancestry.

In regard to possible carriers of cancer prevalent in this laboratory, the facts are these:—

I have had 'epidemics' of bedbugs, and of cockroaches. They have not differentiated between cancerous and non-cancerous strains, but have resided with equal familiarity with the one or the other, and have run without limit from one to the other. Their presence or absence has not altered in the least the certainty of cancer falling only in the cancer strains.

It is my experience that when cancer is first put into a strain where it has not occurred before, it tends to appear in the form of sarcoma. Charts 17 and 18 in this report show this clearly. In Chart 17 sarcoma appears in the second hybrid generation in the ratio of 2:5. Carcinoma appears in the third generation.

In Chart 18 sarcoma appears in the second hybrid generation in the ratio of 3:7. Here also carcinoma appears in the third generation.

In Strain 186, a strain of inbred house-mice, sarcoma predominates in the first inbred generation.<sup>4</sup>

In Strain 190, a hybrid strain of grey-white piebald mice, sarcoma appeared in the female parent. The later members of this strain all show carcinoma.

The conclusion seems warranted here that in a strain of mice the more embryonal tissues yield first to the formless proliferation of cancer. As cancer becomes more deeply seated in a strain, the more highly differentiated tissues yield, and carcinoma becomes the dominant form of neoplastic growth. All my strains long cancerous show tremendous predominance of carcinoma over sarcoma. This fact seems to connect logically with the fact already mentioned that as the cancer ancestry behind a strain deepens, more and more of the tissues show the tendency to neoplastic growth; so that mul-

tiple tumors are more common than single growths in a family in which cancer is old.

Let me take up again at this point the matter of inbreeding in connection with cancer. It has been inferred by some of my readers that because inbreeding does not characterize the human race, the results obtained in these experiments do not apply to man. Nothing could be farther from the truth. As I have said, in order to find what went into a hybrid strain it is necessary to breed it out (that is, inbreed the progeny). But as has already been pointed out, crossing one of these cancerous or heterozygous progeny with similar individuals from wholly unrelated cancer strains will just as inevitably transmit cancer as will inbreeding within a cancer strain.

In the general matter of the increase of cancer, outbreeding will do more to increase cancer than inbreeding could, for inbreeding (mercifully where an undesirable character is concerned) has one quality which outbreeding lacks, viz., it kills off the strain. Note Chart 1, Strain 139. This strain, carried through many generations of inbreeding, was dying out. The introduction of a member of this strain, viz., female No. 529, who had no young by her brother male No. 553, into a hybrid cross with male No. 242 from an unrelated strain, produced a prolific and highly cancerous strain 146 (Chart 3), and started up anew a whole line of cancerous individuals.

Again, the mother of this female, viz., female No. 293, produced few offspring that lived to grow up when mated with her brother. But when crossbred with a wholly unrelated male she produced Strain 65 with its offshoots, which is a persistent and highly cancerous strain in the laboratory to-day, carrying cancer into every strain with which it is hybridized.

Charts 11 and 12 showing Strains 343 and 450 respectively, present cancerous families dying out from inbreeding. Indeed, my experience tends to show that where a strain is old in cancer and where inbreeding is the rule and cancerous members are selected for the matings, individuals eventuate whose growth processes tend to run almost wholly to cancer and not to reproduction. This fact also tends to strengthen the theory of cancer as a mode of growth and not an infection.

It has been suggested also by some of my critics who evidently based such an opinion upon Strain 139 and completely overlooked all the hybrid strains of which my reports consist, that this process of inbreeding which weakens a stock thereby also renders it peculiarly susceptible to cancer.

As I have already said, cancer eventually wipes out a strain in which it occurs where cancerous individuals are selected for the matings, if inbreeding is persisted in. The growth process seems to be diverted more and more, as cancer ancestry deepens, into abnormal types of growth, and less and less into normal types. But inbreeding if persisted in eventually wipes out any strain which I have handled. The strains in which cancer appears, however, are in their early generations, strong strains by every criterion of strength. The individuals are large, well formed, bright eyed, smooth and thick coated, intensely active, not easily subject to infection, highly reproductive, and of long life. Many of the mice live to be four or five years old.

The individuals of a cancer strain who show cancer are some



of the largest, strongest mice in the strain. Some of these cancerous mice are so strong in growth process that they live to bear and rear five or six litters of young while supporting at the same time a cancer. These young are strong and vigorously reproductive mice. Only rarely does a weak mouse develop cancer, another point which seems to strengthen the theory of cancer as a mode of growth.

This whole question of the relation of the causes of tumor growth to the causes of normal growth is vastly interesting.

I find that in my established tumor lines a decrease of the food to a point which produces general emaciation lowers the cancer rate in that family. It also lowers the death age, and increases the number of causes of death from common infection. It lowers also the rate of reproduction. It lowers then the tumor growth and the normal growth. It increases the susceptibility to infections. Moreover, where a tumor does appear in an individual whose normal growth processes are poor, it is of very slow growth. There is a female in my cancer stock, at present, the hybrid product of four cancer strains. She is emaciated and non-reproductive. Her tumor, which appeared July 7th, 1914, is at this date (Dec. 6th, 1914) still no larger than a one-month growth. The well-known slow growth of tumors in old individuals, both in mice and in the human species, may easily be explained by the lack of any strong growth processes. The presence of tapeworm in a cancerous mouse greatly retards the growth of tumor by withdrawing the food supply from the host. Tapeworm is a very common cause of death in this laboratory and such retardation of tumor growth in individuals who show advanced tapeworm at autopsy has been noted very frequently.

On the other hand, as I have already reported, constant reproduction in a cancerous female in the prime of life has in every instance in which it has occurred in the laboratory been accompanied by a retardation of tumor growth. But when a strong cancerous female is not reproductive her tumor grows with great rapidity.

The conclusions here seem to be:

1. An individual with poor normal growth has slow tumor growth.
2. An individual whose growth processes are used in reproduction shows slow tumor growth.
3. An individual of good growth power whose normal growth processes are not being used shows rapid growth of neoplasms.

The clinical behavior of cancers in this laboratory is opposed to the theory of infection.

1. Infection takes the weak individuals. Cancer selects the strong ones.
2. Reduction of feeding and consequent lowering of resistance increases liability to infections; it lowers the cancer frequency.
3. Vigorous growth processes are necessary for tumor growth. They militate against infections.
4. A very slight infection will kill a pregnant female. Tumor growth is retarded by pregnancy.
5. The results of these experiments show cancer to be hereditary in the strict sense. The infections common among my mice are no more liable to occur in one family than in any other if the individuals



are separated from one another; whereas cancer crops out no matter where the mice are kept.

6. The infections common in this laboratory spread not only through the cage, but to adjoining cages. The most careful and long continued experiments have failed to show a single case of transmission of cancer by contact in the same cage or in adjoining cages.

7. If an infected mouse dies in a cage and is partly eaten before it is removed, every mouse in the cage is liable to be swept off by the same infection. Over and over again, the cancers of mice have been eaten by their mates or by mice placed with them as controls. I have never had a case of cancer in such controls. Portions of the cancer and of the viscera of dead cancerous mice have been systematically fed to mice in control cages without a case of cancer in such controls.

8. Cancer is a disease of middle and advanced age when the normal growth processes are confined to regeneration and reproduction. Infections are diseases of early life, when growth processes are largely accretions in quantity and in complexity.

Whether or not cancer shall prove to be an infection, it has one profound difference from any infection known to man. It follows the laws of heredity with an inevitableness which makes it a character that can be manipulated. It can be bred into and out of strains at will. It can be put into a strain where it has never existed and it can be drawn out in extracted lines which can produce nothing else; or it can be bred out of a line one side of which originally carried one hundred per cent. of cancer.

Cancer is not transmitted as such, but rather as a tendency to occur from a given provocation, probably in the form of over irritation. The elimination as far as possible of the causes of over-irritation to the tissues of all individuals of high cancer ancestry should go far to eliminate the provocation of cancer; and the eugenic control of matings so that cancer shall at least not be potential in both sides of the hybrid cross ought to eventuate in a considerable decrease in the frequency of human cancer.

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## THE TWO-STAGE OPERATION FOR CANCER.

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A study of the case histories of over one thousand operations for carcinoma of the abdominal viscera, performed by my colleagues Dr. F. E. Bunts and Dr. W. E. Lower, by my associates at Lakeside Hospital and myself, shows that after certain operations, especially those for cancer of the stomach, rectum and large intestine, the vitality of the patient gradually sinks to death and that the phenomena of this decline can be explained neither by the operation itself, nor by the patient's *apparent* condition before operation. In these cases the succession of symptoms is general loss of vitality, thirst, anorexia, depression, drowsiness, unconsciousness, and finally death, all in spite of the fact that the operative wounds are healing normally. What then is the cause of death if neither the disease process nor the operation is to be held directly responsible? Certain laboratory researches suggest both the cause and a means by which the fatal postoperative sequelæ may be obviated. These researches have shown that stimuli which activate the organs comprising the kinetic system—the brains, adrenals, liver, thyroid and muscles—increase the hydrogen-ion concentration—the acidity—of the body.

We know that all the tissues and fluids of the body except the urine normally are alkaline and that a neutral or acid condition of the body fluids is incompatible with life.

Normally, the acid by-products of energy transformation, in response to the ordinary stimuli of every-day life, are neutralized by the alkalies and bases received from food. If the body be subjected to an overwhelming activation, however, so that the stores of alkalies and bases in the body are insufficient to neutralize the sudden preponderance of acid by-products, sudden death—acid death—may result. On the other hand, if the body be subjected to a continuous abnormal activation, so that there is a continuous formation of acid by-products in abnormal quantities, the mechanism especially involved in acid neutralization—the brain, the adrenals and the liver—is taxed beyond its powers, and either all of these organs or one of them, the weakest, falls under the continuous strain.

That carcinoma is such a continuous activating stimulus is evidenced not only by its clinical effects, but by the histologic changes it produces in the brain, the adrenals and the liver, and by increased H-ion concentration of the blood.

It can easily be seen, therefore, that in operations for cancer, the acid by-products resulting from the trauma of the surgical operation, from the anesthetic, and from the emotional stimuli might readily overwhelm the vital organs concerned in acid neutralization already taxed by the drain upon them of the constant stimuli from the disease itself.

In addition, on account of the loss of appetite so frequently seen in cancer, the intake of alkalies and bases in the food is far below normal.

These facts suggest various methods by means of which, in cases of cancer, the production of acids may be minimized and the stores of alkalies and bases increased.

Food, water and glucose, and sodium bicarbonate should be pushed before the operation. Every possible psychic aid should be employed to diminish the emotional stress incident to the operation. Nitrous oxid-oxygen rather than ether is the anesthetic of choice, because we have found both in the laboratory and the clinic that ether alone markedly changes the brain, the adrenals and the liver, while nitrous oxid-oxygen alone not only does not injure these organs but measurably protects them against the damaging effect of surgical trauma.

*Anociation* should be employed throughout the operation, for observation both in the laboratory and the clinic have shown that the H-ion concentration, so markedly increased by trauma under inhalation anesthesia alone, remains unchanged under anociation.

If examination of the blood of the patient shows a marked acidosis, morphine should not be administered, for while morphinization hinders or inhibits the formation of acid by-products, it also hinders or inhibits the activity of the acid-neutralizing mechanisms. Sodium bromide, therefore, should be substituted as a sedative in these cases.

Finally, in bad risks, and when an acute acidosis impends, the operation should be divided into two stages, so as to minimize the trauma of the operation and the strain of extensive wound repair.

In cancer of the stomach, especially, a gastro-enterostomy may assure the nutritional balance, after which resection may be performed with increased safety. In cases of extreme starvation von Eiselsberg's method may well be employed, that is, a preliminary jejunostomy under local anesthesia, the final operation being performed after a safe vital margin has been secured by the increased store of alkalies and bases acquired by feeding.

By lessening the amount of the trauma inflicted at one seance and by relieving the patient from the burden of extensive wound recovery simultaneously with the functional adjustment, the probability of precipitating a fatal acidosis is far less than when one massive chance is taken.

The two-stage operation also makes possible the differentiation between ulcer and cancer of the pylorus. More than once I have diagnosed growths in the stomach as cancer before operating and during the preliminary operation, only to find at the second operation, from ten to twenty-one days later, that the tumor had disappeared. Had I proceeded on appearances alone and made a gastric resection in one séance, the starved, emaciated patient would have been endangered by the resultant acidosis.

Willy Meyer and Lilienthal have mentioned similar cases.

While the danger of acidosis is not as great with cancer in other localities, the advantages of the two-stage operation in many cases are too great to be overlooked.

In cancer of the rectum a preliminary colostomy prepares the way splendidly for the major operation.

In cancer of the cervix the local cancerous growth should be first destroyed by cautery, the abdominal hysterectomy being performed not less than twenty-four hours later, that the death of every detached cancer cell may be assured.



The advantage of the two-stage operation for cancer of the larynx, I have described in detail elsewhere.

In addition to the physical advantages of the two-stage operation, in many cases it serves to diminish psychic stimuli as well, for the experience of the associated patient in the first stage is so much easier than his anticipations that he approaches the second stage with increased equanimity. It is the anesthetic which is most dreaded by patients, and the absence of unpleasant and painful after-effects after nitrous oxide, in almost every instance, has made our patients approach the second stage with indifference.

#### SUMMARY.

The two-stage operation in certain cases of advanced cancer gives the surgeon his maximum opportunity for lessening the operative mortality rate in many of the gravest surgical risks. Thus we may triumph over surgical difficulties by strategically dividing our forces.

Since I have recognized the dominating importance of acidosis and have evolved a strategy by which the supply of the neutralizing bases and alkalies in the body may be increased, and the drain upon the neutralizing organs diminished, by eliminating as far as possible from the surgical technique the acid-generating factors, the mortality rate in these desperate cases has been steadily falling.

## SKIN CANCER AND ITS TREATMENT.

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The types of skin cancer are numerous; in a clinical grouping, though, the pathologist would distinguish all of them as epithelioma and perhaps divide the degrees of structural changes which occur. To the practical everyday medical man, however, the objective evidences mean more than the microscope may prove, and this article is written to present some simple facts for the guidance of those practitioners to whom the patient comes first for advice as to simple evidences.

The predisposing influences in skin cancer are age (maturing), and the presence of anomalous lesions of the skin, such as warts, moles, seborrheal patches, prior skin diseases of persistent type (xerosis, keratosis, lupus, syphilis, etc.), and injuries of local origin.

The chief contributing causes are dandruff (lighting on a spot predisposed, eye glasses impinging upon a roughening spot), irritation of any sort, including the persistent picking of the individual, the pipe, cigar or cigarette of the smoker.

The epithelial cancer may occur at any site, but predilects the nose, lip, eyelids, *alæ nasi*, cheeks, ears, neck, backs of hands, and the genitals. The cancer itself may begin with a thickened scaling patch, a cystic gland (or glands), a leucodermic patch (as on the lips and tongue), in an excoriation with thickening borders and base; in a granulomatous change in a fibroma, nevus, wart or other tumor, or it may start in the site of an old scar of luetic origin.

The ages above forty predispose, and the older the subject the more likely are keratinous spots to break down into malignant growths.

Epitheliomata are often self-limited and self-destructive (*e. g.*, the benign cystic epithelioma), but more often, once established, they persist and are apt to go on to an increased growth with proportionate destruction.

Any scaling patch on the skin covering a wart or granular base is suspicious and any scaling wart, mole, or small growth is suggestive of cancer. Seborrheic patches, particularly, found on the face and neck will go on to destructive lesions if not checked. Accumulations of epithelial cells, as in cutaneous horns, genital cystic glands, scars from old herpetic eruptions, may be the sites of explosions.

Many epithelial cancers will persist as simple excoriations, lasting for years, only to grow suddenly deeper and to develop the rodent ulcer, or, as vulgarly called, 'rose cancer.'

A mole, ordinarily a mere blemish, soft and flabby, will slowly grow firmer and change in the quality of its fibroid structure, the hyperplastic overgrowth becoming granulomatous and finally breaking down. A simple sessile wart on the eyelid will thicken in its base, push up the warty surface, form a granulomatous founda-

tion and slough off, fulminating into a large ulcer taking in even the sclera itself.

Scaling lips will fissure and heal and do this repeatedly over years; in the lines of breaking skin there will form either small thick warts or excoriated thickened masses, finally forming cancers. Pigment dots on the backs of the hands will scale in older subjects, growing darker, even black in color, and then break into small open ulcers, crusting often, but never healing.

These are types of epithelial cancers demanding early recognition and attention.

The diagnosis is easy, but usually is not made early enough.

In the movement for the dissemination of the knowledge regarding cancer, more stress should be laid on these skin lesions than is usual; for when they are disseminated, as so often happens, over the face and neck, the treatment is more uncertain and the result problematic. More than this, the metastatic possibilities are large with so many foci, any one of which may become suddenly active and destructive.

In spite of the recent widespread discussion of cancer, the treatment of cancer is still a matter of uncertainty among men who practice medicine and not surgery.

It is the object of this paper to convey some of the means available to the general practitioner in caring for skin cancer in cases where radical surgical interference is not indicated or where it may be of doubtful service. No such discussion should be undertaken, however, without the frank declaration that where a skin cancer is so placed that free excision, without undue mutilation, can be practised this should be the procedure of choice, and, when chosen, that the excision should be extensive enough to preclude any likelihood of any remnant of the growth. The types of skin cancer here considered explicitly embrace those discussed as epitheliomata and exclude those malignant growths beginning in deeper structures or primarily involving them.

The treatment of epithelial cancer is essentially destructive and may be effected by the use of acids, caustics, pastes, plasters, the thermocautery, the galvanocautery, the high frequency current, the x-ray, and radium.

*Acids.*—More harm than good results from the usual employment of acids, such as carbolic acid and nitric acid, for these only irritate the surface and actually stimulate growth. To accomplish any good with acids, the treatment should be distinctly escharotic, and the only acid which is of real service is the *trichloracetic*, or *glacial acetic acid*, used pure. The indication is only in keratinous spots and in keratotic cancers where there is no great depth; in other words, where there is only a localized thickened epidermis of epithelioma proclivity. The method is carefully to surround the area to be burned with a stiff ointment, or to paint around the spot with collodion, or to cut out of a piece of adhesive plaster an outline of the growth, so that the healthy skin may be protected against leakage of the acid; of course no ointment should cover the area to be treated. A drop or more of the acid is applied to the growth by means of a glass rod. The spot, in from two to three minutes, should turn white, *when the acid should be promptly neutralized* with carbonate of soda. The resultant eschar will dry hard, as a rule, but in any event comes away in a few days, after which the



ulcer remaining should be treated as any simple ulcer, with cleanliness, stimulating dressings, etc.

*Caustics.*—*Chloride of zinc* in saturated solution and the acid *nitrate of mercury* may be exemplified as the only serviceable caustics, used as such. With both, the surface of the growth (and this treatment is indicated only in small growths) must be denuded, the area about the growth protected as indicated under *acids*. The chloride of zinc solution should be applied on cotton saturated with it and should be left in place, ten to twenty minutes only, lifted for examination of the area treated, replaced and reexamined until the eschar (usually white) shows. Then the area should be well washed and dried and kept wet with boric acid solution until the slough separates, which should be within three to five days.

The acid nitrate of mercury is applied just in the same manner in all particulars as the trichloracetic acid, always with the same precautions as to the time of application (about three to five minutes, depending on the area affected) and as to *neutralizing the acid afterwards* with bicarbonate of soda (the carbonate may also be used).

Under the head of caustics should be named *liquid air* (employed by those expert in its use, and hardly to be recommended to others) and *carbon dioxide snow*.

The *carbon dioxide* has a large usefulness in all epitheliomata of either granulomatous type or of semi-fibroid formation; it is of very little service in open ulceration, or in large areas. The ease of application commends this remedy. The *snow* is collected from an ordinary tank of carbon dioxide gas, by enveloping the escape opening of the tank with a chamois skin sac, or an improvised cylinder of blotting paper (2 or 3 in. long and  $\frac{1}{2}$  in. or more in diameter) held together with adhesive plaster. The snow packs slightly as it escapes, but may be packed into the shape of a cone by the use of an ordinary ear speculum; the author frequently uses the cap of a fountain pen to make the mold for the application. As a pencil, held with its end against the growth, with a pair of forceps, the stick of carbon dioxide snow is firmly pressed into the spot to be treated and so held for thirty to sixty seconds, by the watch, or by counting. The process freezes the growth, which becomes red afterward and may have an area of swelling about it for twenty-four to forty-eight hours. In twenty-four hours the area in contact with the snow will blister. This blister should be allowed to collapse, dry and crust without interference. At the end of four or five days the whole top will slough off, usually leaving a simple excoriation, which heals kindly, under ordinary Z. O. plaster, daily dressings.

*Pastes.*—The best of the pastes is Bougard's.\* It should be used

\*Bougard's Paste:

1. Wheat flour... ..3iv
2. Starch (powdered)... ..3iv
3. Powdered arsenious acid.gr. iv
4. Powdered cinnabar.....gr. iv
5. Sal. ammoniac.....gr. xx
6. Corrosive sublimate...gr. ii
7. Zinc chlorid crystals.....3iv
8. Boiling water.....3i

The first six ingredients are thoroughly mixed and reduced to powder.

The chloride of zinc is dissolved in hot water.

The chloride of zinc is now added *gradually* to the first six ingredients (already mixed), thoroughly stirring until a mass is formed of the consistency of putty, but jelly-like in its resiliency.

The mixing should be done on a water bath and the paste when made should be kept in glass.

with great care, and never near a mucous orifice, as the eye, genitalia, or on the lips. It should not be used over an area larger than a 25 cent piece, though it may be repeated several times in a cancer of larger size than this, provided that a second or other subsequent application should not be made until the first or previous application has been completed in all its detail. This detail follows:—

First, denude the surface of the growth with a curette; stop the bleeding. Measure the size of the growth (or ulcerated area) carefully; then form a mold of the paste just large enough to cover the exact area; lay this over the area and cover well with Z. O. plaster. Where the area is large, the cancer painful, the patient advanced in years, 10 per cent. cocaine may be added to the paste by rubbing the cocaine (in solution) into the paste at the moment of using. There will be pain and this will last most of twelve to sixteen hours. Twenty-four hours after application the paste should be removed. The area of the eschar should then be kept moist with wet dressings, flaxseed meal or other warm poultices, until the slough comes away, usually in four or five days. The application is then 'complete,' and a second or other subsequent application may be made in the same manner.

The ulcer remaining after the use of the paste is usually clean and healthy and may be closed in a week to fourteen days by the use of a 15 to 20 per cent. ointment of balsam of Peru in zinc oxide ointment, changed night and morning.

*Plasters.*—Resorcin plaster and salicylic plaster (made with rubber and lead plaster on muslin) may be employed in keratinous areas on the face, neck and hands, especially where these are numerous, superficial and in widespread patches. The plasters may remain on over night or for twenty-four to forty-eight hours at a time.

The definite advice should go with the use of the plasters to use soap and water freely and briskly when the plasters are removed, and before they are reapplied. Judgment must be exercised and must be acquired in determining when the plasters have been used long enough.

The *thermo-cautery*, *galvano-cautery*, and the *high frequency spark* may be considered under one head as they serve the same general purpose, with differences in their individual application. The *galvano-cautery* is of service in lesions in the buccal cavity and on the tongue, on the borders of the eyelids and about the genitalia, where the heat from the actual cautery (Paquelin) or a stray spark from the high frequency current might be irksome or might do damage. In other places it has decidedly less usefulness.

In small lesions the fine platinum point of a Paquelin cautery has no succedaneum. It is surgically complete in its perfect destructiveness and in its aseptic eschar left behind, with no bleeding in the process. Even where lesions are large enough for removal first with the curette, the Paquelin cautery serves to complete the destruction and to stop the bleeding.

The high frequency spark may be used in larger areas, and especially where a rapid procedure is desirable. When a fine electrode is employed, definitive areas may be quickly destroyed and the action may be as deep as may be desired. More than this the high frequency current is invaluable in preparing an area of disease for x-ray treatment.

*X-Ray.*—The *x-ray*, again, is a remedy which falls within the practice of the expert and should not be employed by the tyro. Its usefulness is large and serves in all kinds of skin cancer. It is of most service, however, in clearing up scaling, precancerous areas, in treating areas which have been operated or which have been treated by the local measures above described with a view to preventing recurrences. Inoperable or relapsing cancers are often benefited by judicious *x-ray* treatment, and often rodent ulcers of considerable size and malignancy will yield to the intelligent use of the *x-ray*, administered by those expert in its application.

*Radium* is of supreme value in cancers which are inaccessible, as those in the concha of the ear and those on the lip. It is of greatest value in the epitheliomata of the eyelid, where the conjunctiva and the sclera are involved. Its use is yet in the experimental stage, but the results reported by various observers and those obtained by the author of this paper justify the opinion that it is a valuable remedy when employed intelligently, and in skin cancers it has a certain, known therapeutic efficiency.

Radium is expensive and its use is, therefore, limited so far as its availability is concerned. It will clear up superficial skin cancers, even when ulcerative, with one application of 10 to 30 mgrm. of radium element, used for one or two hours. We are not citing cases, but dealing only with remedies and their methods of usage, so we shall proceed to the technique.

Where superficial action of radium is desired, the applicator (either in the form of a disc, covered with a hard varnish, or in the form of a container of silver carrying the radium salt) is covered with thin lead foil and held in contact with the lesion for the time necessary, varying with the case from one hour to several hours. The shorter the exposure the less likely a burn. Where penetration is desired, the application must be longer and the screening must be used to protect the skin and tissues from all but the gamma ray, which is the factor in penetrative treatment. The effects of radium are slow, sometimes requiring two or three weeks before a reaction shows. There is usually no destructive action from radium, if care is used in screening with brass, rubber, rubber plaster, aluminum, etc., in individual cases. The usual reaction is a profound erythema, sometimes with dermatitis and erosion of the skin, rapidly disappearing after it has reached a crisis in inflammation.

This review of skin cancer has been presented with considerable detail, almost primitive in places, but this method has been followed in order that those already practised in the treatment of skin cancer may overlook the crudities in the paper, while those most interested, the rank and file of practitioners, may be able to gather some points which may help to save some of the victims of cancer among the large number of those unconsciously condemned to this class and who only need the discerning judgment of the family physician to employ some simple means to prevent or cure those cases not yet ready for the surgeon or the expert.



## PRECANCEROUS CONDITIONS.

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Thus far the study of 'precancerous conditions' has been confined almost exclusively to microscopical investigations, and the clinical observation of the occasional degeneration of certain originally innocent lesions into those of malignant character. The result of this has been that cancer has been looked upon as a wholly local affair, idiopathic, so to speak, with little or no regard to the causes which lead up to the transformation of previously normal tissue cells into those of disease, that is, to the basic cause of cancer.

The search has been persistently made for some extraneous cause, such as parasitism, but in vain. When the theory of 'embryonic rests' was evolved this was eagerly seized on as a basis for cancer genesis; but soon all recognized that these alone could not answer the problem, as they existed in numbers in everyone, and there must be some exciting cause which induces them to take on and keep such rampant action as belongs to cancer. Local injury or irritation was then cited as a cause, but it was soon realized that this could not account for the persistent malignant action in the deranged cells, for other injuries in cancer patients healed kindly. And so one theory has followed another in a bewildering manner, and still cancer goes on, with a death-rate increasing over twenty-five per cent. since 1900, as shown by the United States mortality tables, fully 90 per cent. of those once affected dying of the disease.

And yet all along the last hundred years some of those who had most knowledge of and experience with cancer, have, from time to time, acknowledged the futility of surgical operations to control the disease, and have insisted that there was some constitutional state which was the real 'precancerous condition.' John Abernethy, in 1816, wrote: "There can be no subject which I think more likely to interest the mind of the surgeon than that of an endeavor to amend and alter the state of a cancerous constitution. The best timed and best conducted operation brings with it nothing but disgrace if the diseased propensities of the constitution are active and powerful. It is after an operation that, in my opinion, we are most particularly incited to regulate the constitution, lest the disease should be revived or renewed by its disturbance."

Many will, of course, say that this was written long before the days of modern surgery, and before experience and pathology had demonstrated the necessity of very complete excision of neighboring tissues, and before the modern crusade for very early operation and the removal of 'precancerous lesions.' But the answer to this is that with all the intelligent and magnificent efforts of modern surgery, the mortality from this dread disease, as already mentioned, is steadily rising year by year, even up to the present date. If, moreover, the views to be presented regarding the real

nature of cancer, and of 'precancerous conditions' be correct, there is no likelihood that the present cry for the instant removal of everything suspected to be cancerous, or precancerous, will greatly stay this persistent increase in the death-rate of cancer. For, leaving the basic cause of the malady unchecked, new foci of disease will arise in the same manner as did the original *product* of the wrong blood condition, which was excised.

The limits of a brief paper prevent the quoting of a very large amount of corroborative opinion of eminent surgeons, writing on cancer, which has been presented elsewhere,\* but brief reference

From United States Mortality Statistics 1913

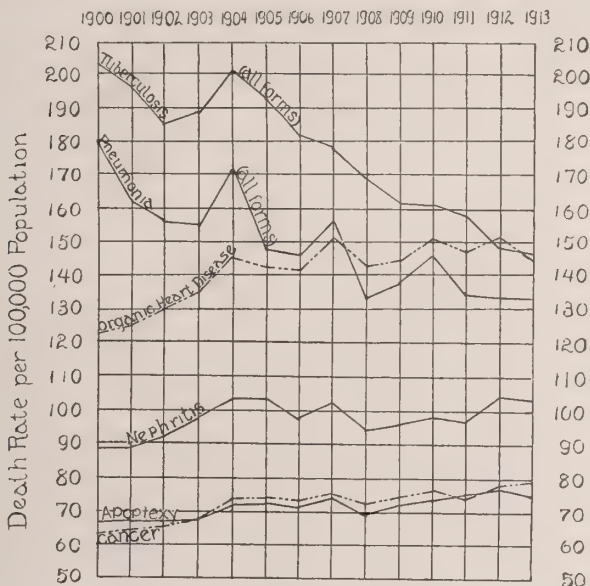


Fig. 1.—The mortality from organic heart disease, nephritis, apoplexy, and cancer has risen steadily since 1900. If we accept the fact that the increasing death-rate of the first three is largely the result of modern civilization, especially from erroneous eating and drinking, it would appear that cancer is due to the same cause.

must be made to the views of one whom all respect, and whose knowledge of and experience with cancer none can question.

Dr. Wm. J. Mayo, in his recent address as President of the American Surgical Association on "The Prophylaxis of Cancer,"\*\* spoke repeatedly, in no uncertain manner, in regard to the probability of there being some constitutional condition back of the local lesion commonly recognized as such. And yet I fear that his clear words alone will make little impression upon the majority of readers, who are so obsessed with the idea of the local nature of cancer, and so possessed by the present craze for surgery. Quite as little impression would probably be made by the remarks of Dr. John B. Murphy, of Chicago, in his presidential address before the American Association of Clinical Surgery. He said that if

\*Bulkley: Cancer, Its Cause and Treatment. New York. 1915.

\*\*Mayo (*Annals of Surgery*, June, 1914, p. 805).

he were to go back twenty-five years and begin again he would certainly take up medical work rather than surgical, for surgery had about reached its limits, whereas the possibilities of scientific medicine were boundless. He repeatedly in his clinics has expressed himself most pessimistically in regard to the ultimate results of the surgical treatment of carcinoma, especially in those patients who are fat, and with lax tissue, that is, exhibiting evidences of imperfect metabolism.

The medical profession and the laity have become so infatuated with the value of laboratory and research investigations that clinical medicine has been put too much in the background, and is often discredited unless supported by the microscope or test-tube. This is especially true in regard to cancer. For while surgeons make the diagnosis and operate largely on clinical grounds, they are very loath to acknowledge the correctness of the diagnosis when cancer has disappeared and remained absent for years under dietetic and medical treatment, even though the diagnosis had previously been made carefully by several physicians and surgeons; for it is, of course, manifestly improper to make a biopsy in these cases.

What is the reason for this reluctance? It is because the disease has too often been considered incurable, except by surgical measures, and yet with these alone it makes a steady increase in morbidity and mortality which is truly alarming. Is it not time for the medical profession to recognize that just as tuberculosis mortality has been reduced over 25 per cent. since 1900, by proper feeding, living, and medication, so cancer can be checked in its 25 per cent. *rise* of mortality, in the same period, by measures of like character?

It is quite impossible in the limits of this paper to present in any full manner the grounds for the rational belief in a constitutional nature and origin of cancer, which have been collected in the work already referred to, but a brief mention may be made of the same. Unfortunately for the belief of some, laboratory and research work have not yet been directed much to the metabolic errors leading up to cancer, but the relatively few studies which have been made have confirmed in a singular manner the results of clinical observation and statistical investigation. From what can be learned, some of the laboratories are now taking up the subject, and there is hope that with their help newer and sounder ideas in regard to cancer will prevail.

As an indication of the faulty metabolism of cancer patients it is to be noted that the urine, under careful volumetric analysis, is rarely if ever that of health; this does not refer to the presence of albumin or sugar, but to the relative proportion of the many other ingredients which compose that excretion, which can be only lightly touched upon. Many writers have reported great errors in the nitrogen partition, and Reid, from the Cancer Research Laboratory of Manchester, England, states that he has found an increase of amino-acid nitrogen in practically every case of cancer he had examined. This faulty nitrogenous metabolism I have constantly found not only in well-developed cases, but also in very early cases of breast tumors which had been diagnosed as cancer, and also in cases where the cancerous breast had been removed. Blumenthal also states that oxyproteic acids are increased even in very



early cancer, and independently of the size of the tumor and degree of cachexia.

The total output of urinary solids is found to be greatly deficient both in patients with the very early beginning of the disease and during its entire course, unless influenced otherwise by medical care. This I have found to be so universally true in dozens of cancer cases that I have come to look upon it as a feature of the greatest importance in connection with the disease. In a very large number of cases I have had the total urine saved and recorded daily, over long periods, and samples thoroughly analyzed every week, or oftener, and the findings have been to me the surest indications for treatment; I refer to the total quantity, the estimation of solids, the volumetric acidity, the urea, chlorides, phosphates, sulphates, and indican. While we have not yet arrived at a point, and probably never will, where any specific changes in the urine can be regarded of great importance in the diagnosis or prognosis of cancer, long observation has convinced me that a very careful volumetric study of this excretion will demonstrate errors of metabolism in the system whose long existence forms one of the 'precancerous conditions.'

Homely as may seem the observation, I want to call attention to imperfect intestinal action as one of the causes and indications of a 'precancerous condition' in the blood which is of importance. Seldom do I find a cancer patient, either with very early or late lesion, who has habitually a normal excretory action of the bowels. In most instances there is habitual constipation with an irregular dependence on laxatives, or there is a history of neglect with alternate obstipation with occasional natural relief, often by diarrhea. Long retention of feces in the large intestine tends to fermentation with enormous micrococcic development, whose resulting toxins are absorbed and are an essential element in the perverted nutrition of cancer, a 'precancerous condition.'

I have been largely quoted as maintaining that meat is the cause of cancer, but that is but a partial and a false conception. Experience and the study and analysis of laboratory work have fully satisfied me that cancer is one of the end-products of faulty metabolism, and this disordered and imperfect metabolism, resulting in some chemico-physiological derangement of the blood-stream, may be produced in many ways. Statistics show clearly that as the consumption of meat has increased in various countries, the mortality from cancer has steadily risen; thus, in England the yearly consumption of meat has doubled during the past fifty years, and the mortality from cancer has increased fourfold. But it has also been shown that cancer has increased with the consumption of coffee, and also in those who indulge habitually in alcoholic beverages.

These errors in diet, however, are only some of the elements belonging to modern civilization which have contributed to the steady increase in the mortality of a number of chronic ailments whose death-rate is also increasing at an alarming rate. Thus, according to the United States Mortality Statistics, the deaths from apoplexy and Bright's disease have each increased over 15 per cent. from 1900 to 1913, those from organic heart diseases almost 20 per cent., and from cancer over 25 per cent. during the same period. All the first three are recognized to be largely due to the

incidents of modern civilization, mainly in the line of erroneous eating and drinking, and the conclusion seems almost irresistible that the coincident rise in the cancer death-rate is due to the same cause.

The limits of this paper forbid fuller development of the subject, but the further contributory causes to the poisoned bloodstream which produces and nourishes the rampant cells of carcinoma in their destructive course, with all the potentialities of the disease, must be apparent to all. Such are the nervous strain and stress of modern life, often with its hurried eating and imperfect mastication and insalivation, the over-indulgence in wrongly selected, prepared, and combined food and drink, luxurious and indolent habits in many, etc. etc.

The subject is a great one, worthy of profound study, and the only wonder is that there has been such a myopic tendency in scientists and surgeons, who have overlooked the broad medical principles which underlie all nutrition, both benign and malignant, and have spent so much time, money, and energy in searching for some specific cause of cancer, and in the surgical removal of the accessible *products* of the disease, while leaving its main and fundamental cause uncared for.

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## SOME CLINICAL OBSERVATIONS UPON CANCER.

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Laboratory researches have not kept pace with the clinical investigations of cancer in man. In animals, in fishes, and in plants many interesting facts have been collated, the reports of which in the recent literature read like fiction. Unfortunately, however, the biologic chasm between cancer in the lowly forms and in man has not yet been bridged over. Could the eosin-selenium experiments of Wassermann upon mice be duplicated in man, cancer would be robbed of its terrors.

As to the etiology of cancer, we are still groping around blindly in the fertile fields of theory. In lieu of known etiology, the most important working basis, clinically, is the knowledge appertaining to precancerous lesions, and at present for practical purposes it may be stated roughly that *precancerous lesions are the cause of cancer*. That the recognition of precancerous lesions is not of recent date may be ascertained by perusal of the article of Sir James Paget upon eczema of the nipple, with subsequent mammary cancer (*St. Barth. Hosp. Rep.*, 1874, X, pp. 87-89). That removal of the pectoral muscles together with the breast is a very old procedure is shown by Heister's mention of Bidlow's method (Heister: "A General System of Surgery," 1748, 3rd Ed., pp. 11, 15). So aside from improvements in operative technique, the cancer question has remained for generations *in statu quo*, at least in so far as a therapeutic mastery that is in any way comparable to that attained in other diseases, notably diphtheria, is concerned.

For the present, then, the etiology of cancer may be described as follows. Primary carcinoma begins, in the large majority of cases, in a patch of epithelium which has been disturbed by inflammation, usually of the chronic type, or by benign neoplastic growth. The time comes when something occurs that stimulates this crippled epithelium to exuberant and riotous growth, in the course of which it bursts through its normal limiting membrane and trespasses upon the tissues beyond, just as when an engine, deprived of its governor, races. *The slumbering epithelium has awakened as a raging cancer*. What dynamic force, what biologic phenomenon impels this epithelium to burst through its barrier and run amuck in the tissues? In the answer to this question lies the solution of the etiology of cancer. Why are rodent ulcer and cancer in industrial workers so comparatively benign, and why are Paget's epithelioma of the lacteal ducts and chorionepithelioma so rapidly malignant? Why is cancer so common in middle life, and yet so rare in the first and second decades? Why is cancer of the breast in an aged, lean woman so innocuous, yet in an obese woman so malignant? Why is it that after the radical removal of a pea-sized cancer of the breast, virulent metastases and early death have been known to occur, and yet the removal of a widely ulcerating and apparently inoperable cancer has in some instances been followed by complete recovery?



## CANCER OF THE MOUTH.

One of the most fertile fields for the clinical study of cancer is the mouth, because of the ease with which the area involved may be inspected. If there is ever an opportunity for the operative cure of cancer, it is offered when the lip is involved, for cancer of the lip is visible to the whole world, and the patient should come to operation early, when he finds that the crack or fever blister does not heal up, or that removal of the little scaly patch is repeatedly followed by bleeding; yet cancer of the lip, like cancer in other rich lymphatic regions, is greatly to be feared, especially when metastasis to the submaxillary lymph-nodes has taken place. If cancer cannot be mastered surgically in so favorable a site as the lip, what results may be expected when it attacks more concealed regions, as the breast, the pylorus, and the neck of the uterus, which are also rich in lymphatics?

An apparently favorable case occurred in a farmer, aged sixty-four, with a linear crack,  $\frac{3}{8}$  in. long by  $\frac{1}{16}$  in. deep, on the oral surface of the left angle of the mouth; duration, seven months. There was no induration about it. Wassermann reaction negative. This ulcer was excised and microscoped, and proved to be cancerous. It developed upon the basis, in all likelihood, of a tooth laceration of the cheek, which is not uncommon in this situation. The malignant ulcer was ablated in a stage just a little beyond the precancerous. There unquestionably was a time when the lesion could have been excised while still a simple ulcer, *i. e.*, during the precancerous period. That the simple ulcer did not heal may be accounted for by repetition of the dental trauma and the absence of physiologic rest. The Wassermann reaction was made not because the lesion was deemed to be specific, but because it has been established that numerous malignant ulcers about the mouth, and particularly on the tongue, develop upon the basis of preexisting gummata. Hence the recognition and cure of oral syphilis must be reckoned among the precancerous therapeutic measures.

## THE DIAGNOSIS OF CANCER.

The early recognition of cancer is what surgeons are demanding most at present. All lesions whose situation, appearance, obstinacy, as well as those which are in the least expressive of cancer by signs or symptoms, should be considered malignant until proved otherwise. On the other hand, the mistake must not be made of persistently treating non-cancerous lesions as cancer. This occurred in a patient who had what was apparently an ulcer between the inner canthus of the right eye and the ala of the nose, and who was treated at a good hospital for two years for epithelioma. It took but a brief examination to show *that it was a sinus and not a cancer*, the cause being the carious root of the right upper canine tooth. Acting upon advice to have the root drawn, the patient had the pleasure of seeing the supposed cancer disappear within a few days!

## THE CURE OF CANCER.

*The only 'sure cure' for cancer is to prevent it by removing precancerous foci.* This includes seborrheic keratoses, sebaceous cysts, warts (*nævi*, molluscum fibrosum, pigmented moles (melanotic sar-

coma); to cure chronic ulcers, whether in the stomach or on the leg; to repair tears, as of the cervix uteri; and to substitute linear for spreading scars or for cheloids, when possible. All such precancerous foci should be subjected to microscopic scrutiny for the beginnings of cancer, for in a large series there must be some that will show the transition.

The knife still reigns supreme in the therapeusis of cancer, although the Percy cautery is a pretender to the throne. Radium serves its best purpose in the palliative treatment of inoperable cancer of the uterus. In these days of enlightenment, pastes and potions have no legitimate field in the treatment of cancer. Until science reveals the true cause of cancer and its cure based upon that cause, the best way to combat the scourge is through the combination of an intelligent patient, an alert physician, and an efficient surgeon.

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## NOTES ON THE RELATION OF SOMATIC (Non-Neural) NEOPLASMS TO MENTAL DISEASE.

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AND

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### I. THE RELATION OF ONCOLOGY TO PSYCHIATRY.

The field of oncological research strikes the outsider as exceedingly well tilled. Cancer institutes are numerous in many lands, and their endowments are objects of envy to less favored research workers. The novel lines of research in teratology, in heredity, in tissue immunities, in cytology, in vital statistics, in surgical technique, in medical physics and medical chemistry, which are now being laid out and followed by eager workers in cancer research, must prove of tremendous value to medical research as a whole. The neglected science of neuropathology and its psychiatric branch, in which there has been such an awakening of interest latterly, must profit indirectly by the results of the oncologists. Neuropathology must naturally receive more than it will give. In one direction, perhaps—namely, that of cytology, studies of the nervous system have the advantage afforded by cells whose appearances may be studied for centimeter or decimeter lengths under a great variety of conditions. General pathology has too long neglected the fundamental values of neurocytological study. Possibly, too, the study of psychopathic heredity will contribute a little to the theories of heredity in general and aid in the illustration of tumor heredity, but in general the flow of advantage must be in the opposite direction. Workers in various branches of psychiatry, and particularly workers in the field of feeble-mindedness, are looking eagerly to the general field of oncology for information about malformations that may aid in the study of mal-development by and large. In the field of teratology, the interests of oncologists and neuropathologists are united.

Descending to more concrete relations, it is clear that knowledge about neoplasms directly affecting the nervous system must contribute immensely to psychiatry. The resolutions of the old gliosarcoma problem will solve a number of cytological problems that have a direct bearing upon structural interpretations of brain findings. The physiologist and the modern physiological surgeon are concentrating attention upon heightened intracranial pressure and dilatation of the ventricles as so often caused in a clinical case by brain tumor. Brain surgery is sometimes reproached with the paucity of its practical results,—meaning by *practical*, individual therapeutic successes; but such work as that of Kocher, Horsley, and more recently, Cushing, cannot be charged with lacking results of the greatest theoretical importance. Cushing's book<sup>1</sup> on the



pituitary body has opened out fields of research of the widest overlap. Brain tumors threaten to become a special field, engaging the entire time of special and highly trained workers.

From the side of the psychiatrist himself comes a particular interest in brain tumors as productive of mental symptoms, and perhaps of particular mental symptoms as emphasized by Schuster<sup>2</sup> in 1902.

It would be of great theoretic value could Schuster's results be corroborated in a modified form. As these results are not well known, we may state that he believed that cases with heightened irritability, maniacal excitement, or allied states, were to be found with tumors occurring in any of the brain parts; but he thought that cases with confusion, delirium, or allied states, were most often found with occipital lobe tumors, and only very infrequently with frontal lobe tumors. Mania is especially rare with frontal lobe tumors. On the other hand, he felt that hysterical, neurasthenic, and hypochondriacal symptoms were to be found as a rule if the tumor was frontal or temporal in site. Schuster confirmed the prevalent idea that moria (Witzelsucht) is found with frontal lobe tumors, but he also found the same symptom with tumors elsewhere. Moral insanity cases, Schuster found when associated with tumors to be associated with frontal tumors. This finding might be in line with modern notions of the inhibitory function of the frontal lobes. On the whole, frontal, temporal, and occipital tumors are those which produce active symptoms. Tumors of the corpus callosum and of the parietal lobe are as apt to produce inactive forms of mental impairment as active symptoms. Schuster's work may be mentioned as an example of the kind of interest which psychiatrists now take in brain tumors, in addition to the well-recognized data of extirpation neurology that have held the floor since the 70's of the last century. It is extremely difficult, however, to tell whether an apparently destructive tumor has really destroyed the tissue of the locus it occupies, or whether functioning fibres may still thread their way through the tumor. In some recent work from this laboratory<sup>3</sup> we were forced to discard cases of tumor of the thalamus as rarely affording consistent results capable of interpretation, on account of the fact that the degree of parenchymal change could not be in any way determined.

On account of the situation here sketched, it is stringently necessary that all properly worked up cases of brain tumor coming to autopsy shall be published *in extenso*. The number of such cases hitherto published is not extremely large if we include only cases in which both clinical and anatomical standards have been high.

Another important line of research deals with the symptomatic psychoses. Are there psychoses of genuine oncogenic origin, where the tumors lie not only outside the boundaries of the nervous system but do not directly encroach upon it? The leading worker in symptomatic psychoses of recent years is Bonhoeffer.<sup>4</sup> In connection with some of the cases to be sketched in Section IV of this paper, the contentions of Elzholtz<sup>5</sup> are of interest. Elzholtz describes psychotic conditions in the cachexia of carcinoma, recalling psychoses of infection, having sudden outbreak, in part delirious and epileptiform features, in part the symptoms of amentia (in Meynert's sense). Bonhoeffer regards these phenomena of cancer cachexia as resembling those in various other forms of cachexia; they are as a rule of delirious character, but stuporous and amentia-

like conditions are not infrequent. It can readily be seen how important particular cases might be in the decision as to the true nature and genesis of the so-called amentia of Meynert. Bonhoeffer has considered this topic *in extenso* in 1912.<sup>6</sup> To be sure, we must remember in connection with carcinoma of the gastro-intestinal tract, that the older authors made fantastic claims which have never been substantiated, as to the relation between these diseases and mental disease. Griesinger spoke of that era as the era of Kopropsychoiatry. The correlation of gastro-intestinal disorder with states of morbid depression seems to have stood, although whether the gastric condition is primary and the depression secondary remains a question. A recent discussion of this topic has been made by Ploenies,<sup>7</sup> who regards gastric disorder as the cause of certain imperative ideas and other depressive symptoms. Ploenies goes so far as to believe that cases of morbid depression are cases in which the posterior wall of the stomach is especially subject to injury; and that the mechanism of the depression is the result of pressure conditions in the stomach due to dorsal decubitus in sleep. Bonhoeffer rightly placed an exclamation point after his summary of Ploenies' account.

More recent work in this direction was done by Mueller<sup>8</sup> and by H. W. Koch.<sup>9</sup> On the whole, the hypothesis of gastro-intestinal autointoxication as a cause of mental disorder is not now regarded as well grounded. There is a thesis by Mariotte on the mental state of cancer patients.<sup>10</sup>

*Refusal of food* by certain gastro-cancer patients, *insomnia*, the not infrequently entirely absent symptom of *pain*, the also not seldom absent symptom of *vomiting*, bring up a host of special problems of great interest. Some of these are considered in Section III of this paper. The writers have made a brief search of the recent literature, notably in the volumes of the *Zeitschrift fuer Krebsforschung*. A small number of communications more or less closely related to this field of interest are here given. A beginning of work has been done by von Dungern and Halpern<sup>11</sup> on complement fixation tests on the cerebrospinal fluid in cancer. Nieden<sup>12</sup> has written upon high spinal fluid pressure in certain cachectic cases apparently due to edema from weak cardiac action. There has been a small stream of publications on the relation of nerve supply to cancers (see the recent work of Aschner<sup>13</sup>). A somewhat curious claim has been made by Bonnier<sup>14</sup> as to the desirability of exciting the bulbar apparatus by cachexia of nasal mucosa to get rid of tenesmus, trismus, and other painful symptoms in certain cases of cancer.

The above will suffice for a sketchy account of the present day relations of tumor research to psychiatric research. Each line of thinking has so many and such profound connections with the rest of medical science that we cannot hope for a solution of most of the problems for many a day. Yet it is clear that careful work is as desirable here as elsewhere.

We have undertaken in the present paper to present in Section I certain general considerations as to the relation of oncology to psychiatry; in Section II, certain statistical features as to the occurrence of neoplasms in the autopsy returns of several insane hospitals available to us; in Section III, certain conclusions as to the distribution of mental symptoms in selected groups of tumor cases (gastric, enteric, uterine, mammary); in Section IV, the interest-



ing question of the possible oncogenesis of certain psychoses, considering only cases of non-neural tumors; and in Section V, conclusions.

## II. THE OCCURRENCE OF NEOPLASMS IN CASES AUTOPSIED IN STATE HOSPITALS FOR THE INSANE.

We have considered the cases of tumor of various organs in the autopsy records of four hospitals for the insane in Massachusetts. The material of the Westboro and Worcester State Hospitals has been drawn upon for general statistical purposes only. The material of the Boston and Danvers Hospitals has been dealt with somewhat more intensively for the reason that the writers themselves personally constructed the index catalogue of the autopsy protocols, which accordingly approximate identical standards and give a basis of 1,788 autopsies for study, and because there is available for the Boston and Danvers collection a clinical symptom analysis on which the conclusions of Section III of this article are based.

Tumors affecting the nervous system directly by destruction or pressure are not particularly considered in this report. Their proportionate occurrence, however, in four state hospital autopsy series is given in the following table:—

Boston. . . . .	200 autopsies,	9 brain tumors,	4.5%
Danvers. . . . .	1,588 autopsies,	51 brain tumors,	3.2%
Westboro. . . . .	500 autopsies,	12 brain tumors,	2.4%
Worcester. . . . .	1,083 autopsies,	25 brain tumors,	2.3%
	<hr/>	<hr/>	<hr/>
	3,371 autopsies,	97 brain tumors,	2.8%

The general figure for brain tumors may be safely placed short of 3 per cent., though perhaps a little nearer 3 per cent. than 2 per cent. Leaving out relatively insignificant late metastases and sundry probable errors in diagnosis, our series may perhaps yield about 2.5 per cent. brain tumors. These should be specially investigated to determine the theoretical index of operability. End-results should be compared with those of a similar investigation of epileptic material.

The large number of brain tumors recently studied at Boston State Hospital is very possibly due to the fact that neurological cases are now coming with a certain increased frequency to the Psychopathic Hospital and later reach Boston State Hospital by transfer.

Let us contrast the brain tumor findings with tumor findings in other organs. The lists include naturally many cases in which tumors were actually found in more than one organ; but no case appears twice in the table below.

Boston. . . . .	200 autopsies,	11 tumor cases,	5.5%
Danvers. . . . .	1,588 autopsies,	68 tumor cases,	4.3%
Westboro. . . . .	1,500 autopsies,	21 tumor cases,	4.2%
Worcester. . . . .	1,083 autopsies,	31 tumor cases,	2.8%
	<hr/>	<hr/>	<hr/>
	3,371 autopsies,	131 tumor cases,	3.9%

Autopsy experience indicates that a number of significant tumors of small size but hidden locus are not infrequently missed in rapid examinations not conducted with general statistical ideals in mind. The chances are, therefore, that 3.9 per cent. is rather too low a



figure than too high a figure. However, 4 per cent. and certainly less than 5 per cent. may be given as a roughly approximate index of the number of tumor cases in a large group of autopsied cases of institutional insanity.

We shall here make no comment on these figures in the light of non-insane material, of which a variety of analyses is available in the literature. (See volumes of the *Zeitschrift fuer Krebsforschung*.)

If 5 per cent. of insane hospital material (fatal cases dying in hospital) exhibits neoplasms in various organs of the body outside the nervous system, still the nervous system and its appendages exhibit fully half as many (2.5 per cent.). Accordingly, neoplasms are not distributed evenly through the bodies of institutional psychopaths, and the importance of brain tumors in the causation or liberation of mental disease may be statistically defended.

Of the importance of brain tumors in the production of mental disease or its equivalent, we do not intend here further to speak, more than to say that a review of Schuster's work on the correlation of particular symptoms and tumors of particular brain-parts needs corroboration and further study with more and better material than that available to Schuster.

Our chosen task here is the consideration of somatic, non-neural tumors in institutional psychopathic subjects.

We have chosen to consider more particularly the cases of Danvers and Boston State Hospitals, and this for two reasons, above-mentioned. First, the autopsy protocols of these two institutions have been carefully analyzed personally by us on identical lines, and the analysis carried to what might seem finical detail, making a study of this sort more profitable than can be the case when protocol analyses are stopped at the 'major' diagnoses only. But secondly and more importantly, there are available for these two series clinical analyses of disease and symptoms, permitting special correlations. The general features of the remarkable Danvers symptom index covering over 17,000 cases, living and dead, have been mentioned in various communications and more particularly in a communication presented at the 1915 meeting of the American Neurological Association. For the present purpose, these features will stand out sufficiently from the analyses below.

The cases in the Danvers and Boston series here considered number 1,788. As might be expected, the site, distribution, nature, and metastatic tendencies of the tumors are exceedingly various. The paucity of breast tumors in all except the Danvers series is striking. Two of 21 of the Westboro cases were of the breast, and only one of the 31 Worcester cases. No case of breast tumor has appeared in 200 Boston autopsies with the exception of one case in which the tumor had been extirpated surgically. The Danvers collection, however, showed 5 cases (possibly 6). These are considered below.

Uterine tumors occurred in 2 Boston cases, 7 Danvers, 4 Worcester. Gastric cancer occurred in 4 Boston cases, in 16 Danvers, and in 5 Worcester. Intestinal cancer occurred in 2 Boston cases, 4 Danvers, 2 Westboro, and 2 Worcester cases. The above groups are considered specially below in so far as they occurred in the Boston and Danvers groups. There was one instance of lymph-node tumor in the Worcester series; the jaw was affected in one Worcester case, as well as in 2 Danvers cases, one of which is par-

ticularly described in Section IV. The tongue was affected in one Worcester case, and in 2 Danvers cases. There was a variety of other tumors which do not call for special discussion, occurring as they did in but one or two instances each. As will be developed in Section IV, the entire list was scrutinized for the purpose of uncovering cases in which there might be a special relation between the tumor and the psychosis. With the exception of those mentioned below, no likely instances were found. The most important groups of cases are apparently those of gastric, intestinal, uterine, and mammary carcinomata. These are presented in tables as follows:—

## GASTRIC CARCINOMA.

Boston.....	11.45	5620	F.	68	senile dementia	
Boston.....	13.22	7467	M.	64	general paresis? (multiple adenomata)	
Boston.....	13.59	3170	F.	84	senile dementia	
Boston.....	14.13	12501	M.	50	toxic psychosis (esophagus)	
Danvers.....	38	1804	M.	50	"acute mania"	
Danvers.....	289	5358	F.	55	senile dementia	
Danvers.....	386	7257	F.	62	epileptic insanity	
Danvers.....	471	6437	F.	50	paranoia	
Danvers.....	479	7153	M.	67	senile dementia	
Danvers.....	648	9998	M.	72	senile dementia	
Danvers.....	676	10115	F.		arteriosclerotic dementia	
Danvers.....	797	7963	M.	72	alcoholic insanity	
Danvers.....	1113	5343	F.	64	alcoholic insanity	
Danvers.....	1134	13358	F.	66	senile dementia	
Danvers.....	1249	13424	M.	80	senile dementia	
Danvers.....	1315	10910	F.	72	dementia praecox	
Danvers.....	1407	12150	F.	68	dementia praecox	
Danvers.....	1480	15806	M.	69	organic dementia	
Danvers.....	1575	14453	F.	64	dementia praecox	
Danvers.....	1599	14021	F.	85	senile dementia	

Of these 20 cases of gastric carcinoma, 12 were female, 8 male. All were 50 or over except a doubtful case (as to carcinoma) of taboparesis of 40 years.

## INTESTINAL CARCINOMA.

Boston.....	13.62	12230	F.	72	senile dementia	colon
Boston.....	14.11	11444	F.	70	senile psychosis?	colon
Danvers.....	50	780	F.	38	"chronic dementia"	rectum
Danvers.....	360	6557	M.	66	primary dementia	rectum and bladder
Danvers.....	1078	13114	M.	54	delirium	colon
Danvers.....	1107	10038	F.	46	?	colon

## CARCINOMA OF UTERUS.

Boston.....	12.28	9407	F.	70	senile dementia	
Boston.....	14.19	6427	F.	63	dementia praecox, catatonic	
Danvers.....	184	3489	F.	60	"chronic mania"	
Danvers.....	210	3992	F.	49	general paresis	
Danvers.....	603	8987	F.	71	senile dementia	
Danvers.....	660	5928	F.	54	"terminal dementia"	
Danvers.....	694	10139	F.	61	senile dementia	
Danvers.....	1297	7511	F.	47	dementia praecox	
Danvers.....	1312	14269	F.	64	psychopathic personality	
Danvers.....	1330	13065	F.	67	senile dementia	

## CARCINOMA OF BREAST.

Danvers.....	370	5607	F.	71	senile dementia	
Danvers.....	397	7315	M.	45	general paresis (tumor doubtful)	
Danvers.....	582	9080	F.	64	paranoia	
Danvers.....	1059	12175	F.	78	senile dementia	
Danvers.....	1380	14811	F.	88	senile dementia	
Danvers.....	1481	14377	F.	81	presenile insanity	

### III. THE MENTAL SYMPTOMS OF CASES HAVING LARGE DEVELOPING CARCINOMA OF CERTAIN ORGANS.

We have given in the previous section tables of cases showing gastric, intestinal, uterine, and mammary tumors. These groups appear to be the only groups large enough to warrant a comparative study of symptoms. We offer a table showing the most frequent symptoms in the four groups, listed in the order of frequency in which they occur in the first, or gastric carcinoma, group.

#### TUMORS.

	Gastric	Intestinal	Uterine	Mammary	
Symptoms. . . . .	20	6	10	6	
Dementia. . . . .	11	2	3	2	18
Disorientation. . . . .	8	0	2	2	12
Amnesia. . . . .	7	1	2	3	13
Incoherence. . . . .	7	1	2	2	12
Motor restlessness. . . . .	7	0	2	5	14
Psychomotor excitement. . . . .	7	0	4	3	14
Auto psychic delusions. . . . .	6	2	5	3	16
Delusion allopsychic. . . . .	6	2	7	2	17
Irritability. . . . .	5	0	3	1	9
Violent acts. . . . .	5	0	0	1	6
Auditory hallucinations. . . . .	5	1	3	1	10
Confusion. . . . .	4	2	1	1	8
Defective judgment. . . . .	4	1	2	2	9
Sicchasia. . . . .	4	1	0	2	7

Let us next arrange the symptoms in the four groups in the order of symptoms occurring most frequently in a series of 17,000 living and dead cases analyzed at the Danvers State Hospital.

Symptoms	17,000	Total	Gastric	Intestinal	Uterine	Mammary
Psychomotor excitement. . . . .	6903	14	7	0	4	3
Delusions allopsychic. . . . .	6844	17	6	2	7	2
Dementia. . . . .	5841	18	11	2	3	2
Hallucinations, auditory. . . . .	5428	10	5	1	3	1
Motor restlessness. . . . .	5428	14	7	0	2	5
Depression. . . . .	5015	6	3	0	1	2
Delusions auto psychic. . . . .	4897	16	6	2	5	3
Insomnia. . . . .	4354	8	4	0	2	2
Incoherence. . . . .	4130	12	7	1	2	2
Amnesia. . . . .	3422	13	7	1	2	3
Violence. . . . .	3244	6	5	0	0	1
Hallucinations, visual. . . . .	3186	4	3	0	1	0
Irritability. . . . .	2714	9	5	0	3	1
Defective judgment. . . . .	2596	9	4	1	2	2
Disorientation. . . . .	2419	18	11	2	3	2
Destructiveness. . . . .	2362	4	3	0	0	1
Confusion. . . . .	2120	8	4	2	1	1
Resistiveness. . . . .	2051	2	0	1	1	0
Delusions, somatic. . . . .	1829	3	2	0	1	0
Sicchasia. . . . .	1597	7	4	1	0	2

We shall make no attempt here to explain the advantages and disadvantages of the kind of analysis which the symptom list records. Some use of the Danvers catalogue has been made in several papers of which we may mention only a paper on the optic thalamus<sup>3</sup> and a paper on the "Somatic Sources of the Somatic Delusions," published in the *Journal of Abnormal Psychology*, December, 1913, and a paper now in press upon the "Mental Symptoms Found in Cases of General Paresis."<sup>15</sup> It is in this last, as yet un-



published, paper that the list in the paragraph above appears, with the addition of the symptom *sicchasia*. With the inclusion of the symptom *sicchasia*, we arrive at a list of twenty symptoms such as to include every symptom that occurs in 20 per cent. or over of any of the series in question. In passing, it may be said that the first ten symptoms, from *psychomotor excitement* through *amnesia*, are the only symptoms which occur in 10 per cent. of all cases of mental disease of whatever nature. Experience with this method of analysis has shown it capable of detecting or suggesting peculiarities in the distribution of symptoms which would otherwise escape one. Difference in the order of frequency amounting to three or even more places are of little consequence. When, however, we discover that *disorientation*, the fifteenth symptom in frequency of occurrence in 17,000 cases, shares first place with *dementia* in a chosen series of carcinoma cases, we are entitled to consider the matter of importance. The topmost place of *disorientation* in the cancer list gives us a lead to the question of *delirium* and *amentia*. As will appear below in our casuistic analysis, *delirium* is perhaps the most frequent mental disease entity which can with any assurance be correlated with carcinoma. If this hypothesis is correct, we should then discover other symptoms of this general nature high in the list. We should find *incoherence* and *confusion* high. In point of fact, *incoherence* does stand high in the list (12 cases, being the eighth). *Confusion*, however, does not stand so high, numbering but 8 cases.

Of course, the majority of cases of cancer occur in elderly persons, as a glance at the table in the previous section will show. Accordingly such symptoms as *dementia* and *amnesia* should stand high. *Dementia*, as just mentioned, shares with *disorientation* the topmost place, and *amnesia* is seventh in the list.

On account of what was quoted above from Bonhoeffer's analysis of the situation with respect to *depression* and intestinal disease, it is somewhat astonishing that *depression*, which stands sixth in the list of 17,000 cases, is exhibited in the cancer list in only 6 cases, namely: fifteenth of sixteen in the complete list.

The occurrence of 7 cases in which *sicchasia* (refusal of food) is striking, since *sicchasia* with 1,597 instances in 17,000 cases is comparatively infrequent in mental disease at large but stands out in the carcinoma cases. If 2 cases of uterine carcinoma with *anorexia* were added and counted as logically similar to *sicchasia*, this feature would be still more striking.

The comparatively small number of cases of *insomnia* (8) among the cancer cases is of interest, since this symptom stands eighth in the list of 17,000.

The paper on general paresis mentioned above demonstrated that certain cases of anatomically mild paresis tended to show a group of symptoms which might be termed contra environmental, namely: *allopsychical delusions*, *sicchasia*, *resistiveness*, *violence*, *destructiveness*. Our list of 42 cancer cases shows *allopsychic delusions*, 17; *sicchasia*, 7 (9?); *resistiveness*, 2; *violence*, 6; *destructiveness*, 4. There is, then, in these cases no great tendency to the execution of contra environmental acts although a marked exhibition of delusions with respect to the *entourage* and with respect to food.

In the paresis group, it was pointed out that the anatomically severe cases showed a group of symptoms of a different order, tending

to the complete ruin of personality, showing themselves in *confusion* and *incoherence*, or in a sort of mental quietus with *euphoria*, *exaltation* or *expansiveness*. *Incoherence* occurred in 12 of our 42 cases, and *confusion* in 8; whereas *euphoria*, *exaltation*, and *expansiveness* were absent from the cases. On the whole, accordingly, we see a tendency to the exhibition of ideational reactions to the world of an unpleasant nature. We do not see in the group thus delimited any marked tendency to over acts against the environment or to marked disorder of personality. Let it be understood at this point that we are not arguing that the group thus defined is a unitary group, but if there is a definite group of oncogenic psychoses included within our series of 42, then these cases have not been able to influence the statistics in the direction mentioned.

Whatever general bearing these conclusions may have will be brought out below.

#### IV. DISCUSSION OF CASES BEARING ON THE QUESTION OF ONCOGENIC PSYCHOSES.

Do somatic neoplasms of known neural site, in no wise directly abutting on or compressing the nervous system, ever produce mental disease; and if so, what is the general character of that disease? Toward the close of the first section, we hastily referred to a number of papers in the literature dealing with this topic. Without further discussion, let us describe such cases as might possibly prove truly oncogenic. For the purpose of this study, we went over all the Boston and Danvers cases (79 in number) and were at once able to exclude all but some 16 cases. Upon further analysis, all of these had to be excluded for a variety of reasons except the following group of 5 cases

Case I is possibly too old a case (1881) to be included, yet a careful history, with autopsy by Sanger Brown, is of some interest. It would appear that the course of the mental disease of possibly slightly over a year's duration may well have corresponded with the course of the physical disease, gastric carcinoma. If we can date the beginning of symptoms of gastric carcinoma with the appearance of anorexia and vomiting, with general ill health, we can without undue forcing convince ourselves that the psychosis in general may have been due, either to the gastric carcinoma or to complications thereof. The details follow:—

CASE I.—A. W., male of South German birth, died at fifty, after a period of mental and physical symptoms lasting seven months, or perhaps thirteen months. Patient was a cheerful, religious, hard-working shoemaker, who about a year before death *lost appetite*, *vomited* occasionally, had *cold hands and feet*, suffered from *general ill-health* ("slow fever," 1881). Patient began to be perhaps hyperreligious and hypersocial, addressing German meetings and doing much Y. M. C. A. work. Six months later, patient suddenly became restless and finally sleepless at night. Despondency over himself and his family's fate after his death followed. Strange belief that the "bed was too short." Suicidal attempt by jumping from window day before admission. Threat of violence to physician. Religious excitement (incessant calls to people to "come to Jesus"). Visual hallucinations of members of Y. M. C. A.

Hospital régime improved physical condition. Constant and increasing mental excitement. Tremor of tongue, coated tongue, emaciation. Shouting, screaming, tearing clothing, incoherent chattering, refusal of food, tube-feeding. Delusion that he was "George Washington." Insomnia. Began to take food regularly.

Seven months later, patient died after abdominal distension setting in two months before death. Bile-stained ascites tapped three weeks before death.



Autopsy by Sanger Brown: Very marked emaciation, chronic endocarditis, atrophic liver, carcinoma of greater curvature of stomach, ascites, general peritonitis.

Case II is a case of cancer of the intestine. This patient was of doubtful age, but was probably over sixty. The total duration of his attack was from three to six months, and the patient was in the hospital but six weeks. It appears that the patient, who was almost an illiterate currier, was by nature an irritable person, and at one time somewhat excessively alcoholic. The psychosis began suddenly with disconnected talk, delusions of persecution by relatives, destructiveness, and attacks of violence, threats to kill wife and daughter. After admission to the hospital, the patient became orderly, was depressed, without animation, and preferred to remain in bed; amnesia; hypochondriacal, and somatic ideas such as "I can't live long," "O, doctor dear, my stomach is full and I can't eat anything," "I feel that I can't get up at all." Insomnia, loss of appetite, occasional tendency to agitation. After a few days, the patient developed symptoms of intestinal obstruction, with pain in the abdomen, epigastric tenderness, swelling and tympanites of abdomen, occasional vomiting, cachexia, without fever. Diagnosis of cancer was made and confirmed by the autopsy. The autopsy showed carcinoma with obstruction of the colon at splenic flexure, and carcinoma of the tail of the pancreas, of gall-bladder, liver, and retroperitoneal lymph-nodes. There were some chronic changes, perisplenitis, perihepatitis, pericarditis. There were soft tumors of the nodules of the liver, some of which were acute. Peritonitis had developed, moderate arteriosclerosis, renal cyst. The nervous system showed a very slight patchy basal arteriosclerosis, a uniformly firm brain, weighing 1370 grm., and a firm spinal cord, corresponding with the diagnosis of generalized mild gliosis. The autopsy in this case was performed by H. A. Christian.

The so-called somatic delusions, 'stomach full,' are of note in this case. It would seem that the time relations of the tumor development and the symptoms might be considered appropriate. It must be granted, however, that the case bears some general resemblance to various cases now put in the vague so-called 'presenile' group. This case seems to run counter to the conclusion drawn above, that carcinoma cases do not tend to react violently against the environment. However, the period of such violent reaction was brief and initial.

Case III is a Boston State Hospital case, with a somewhat curious history of having been at the municipal hospital for tuberculosis, with a diagnosis of "laryngeal tuberculosis," when in point of fact the patient did not have tuberculosis and eventually succumbed to carcinoma of the esophagus with involvement of the stomach and liver. Inability to speak was probably the effect of the esophageal cancer. This case showed excitement, disorientation, and would occasionally jump out of bed without reason. Temperature was occasionally slightly raised. The reason for regarding the case as insane was the difficulty in his management on account of his excitement and impulsive acts. The patient died shortly after coming to the Boston State Hospital. It is a question whether this case would not better be regarded as an infectious case in the sense of an infectious complication of the carcinoma. It might possibly be placed in the delirium group. On the whole, it does not seem that this case goes far to prove any relation between the carcinoma and the psychosis.

CASE IV.—This case is another case of oesophageal carcinoma. The total known period of mental disease was about thirteen months. The patient was amnesic and disoriented and irrelevant in conversation. Vomiting began a month after admission. Feebleness, restlessness, and confusion followed. Appetite remained good. Cases III and IV accordingly resemble each other to some extent. It may be that the symptoms are closely related to a carcinoma, but on the whole the picture is certainly too colorless to permit diagnosis. It might perhaps suggest the diagnosis amentia.

Case V was a Danvers Hospital case in which the diagnosis of toxic delirium was made on the basis of symptoms apparently related to sarcoma of the jaw. The total duration of the psychosis appears to have been two months. There had been evidence of a new growth in the left upper jaw eight months be-



fore death, at the age of thirty-six. Five months later, the jaw was excised, with after treatment of streptococcus serum and x-ray. Two months later the patient was admitted from the Massachusetts General Hospital to the Danvers State Hospital on the score of incoherence, hallucinosis, and delusions. The patient was disoriented for time, place, and person; amnesia for recent events; spells of incoherence. There were on some occasions tendencies to fabrication, such as a remark that he had been working at his trade yesterday, that he had driven through several of the streets of Boston yesterday, that he is at his home. The patient was, however, entirely non-suggestible with respect to fabrication.

The autopsy of Dr. J. B. Ayer, Jr., showed sarcoma of the jaw infiltrating the orbit and sphenoid bone with ulcerations, metastatic nodules in the lungs, cranial lymph-nodes and gall-bladder. There was a chronic ulcer of the epiglottis, and there were a number of other chronic changes, such as perisplenitis, periphelebitis, adhesive pleuritis, adhesive pachymeningitis, nephritis, leptomenigitis. On the whole, the picture in this case seems consistent with the hypothesis of a correlation between sarcoma or infection from ulcerated surfaces of the sarcoma and mental symptoms.

In addition to these cases, we shall present two from the Psychopathic Hospital clinic.

CASE VI.—P. H., 14120, was a Norwegian woman of sixty-one; deaf ever since childhood; latterly constipated; and for six weeks before arrival at the hospital (April 9th, 1915), patient had been vomiting, sleepless, and there was loss of weight. Two days before admission, patient became extremely nervous. Thought people were taking money from the church, and complained of her stomach's burning. Patient was jaundiced on admission but no tumor could be palpated. She was nauseated, and reacted apparently to auditory and visual hallucinations. The patient would sit muttering, "Oh my, Oh my," with an awe-struck expression, staring under the table, and putting her hand over her slightly-opened mouth as if removing a sticky substance therefrom. There were a number of irritative neurological symptoms, always more marked in the muscles about the mouth, which gave rise to the hypothesis that the case was organic. Examination of the head showed a small area of internal hemorrhagic pachymeningitis over the right temporal tip. The brain substance was swollen, there was a moderate degree of lipping of cornu amonis, and tendency to a cerebellar pressure ring with a reduction in consistence of the brain, especially of the frontal lobes and of the cerebellum. The right superior parietal lobule appeared to be firmer than the rest of the brain, alveolar bodies were harder than normal. The brain weight, 1155 gm., suggested a moderate loss. There was a pyloric carcinoma without metastases. There was a great variety of chronic changes, interstitial nephritis, valvular and parietal endocarditis, coronary and mammary sclerosis, ovarian fibrosis, splenic atrophy, fibrinous peritonitis, periappendicitis, pericholecystitis, adhesive pleuritis, hypertrophy of the heart.

The case deserves special study for the purpose of resolving the nature of the peculiar neurological signs shown. The findings are perhaps consistent with the hypothesis of tumor origin for some of the symptoms, but it seems on the whole likely that organic changes of the nervous system cannot be safely excluded.

Case VII is a nurse of Canadian extraction, with one cousin insane. The patient is described as always queer, as not having been able to walk for a year after having had peritonitis at the age of twelve. She is described as having two nervous breakdowns and an attack of mania at forty-eight, whereupon she was in McLean Hospital for two months. The patient worked after being discharged from McLean. Seven weeks before admission, and nine weeks before death, the patient, while visiting friends, became excited, sleepless, talkative, and disagreeable. Patient became jaundiced, but refused operation for supposed gall-stones. At the Psychopathic Hospital, the patient was thought at first to be a manic depressive case, and later to be a paranoid form of dementia praecox.

The autopsy showed carcinoma of the pancreas, metastatic into the liver and the retroperitoneal lymph-nodes and duodenum. There were many chronic changes: perihepatitis, perisplenitis, periaortitis, parametritis, adhesive pleuritis, a general arteriosclerosis, valvular and parietal endocarditis, inter-

stitial and cystic nephritis. There was also an acute fibrosis, pleuritis, and an acute hemorrhagic ileitis. The heart was hypertrophied, there was a chronic focal leptomeningitis, a chronic peripheral optic neuritis, with a central optic neuritis in the right side. There was inequality in the size of the postcentral and pyriform gyri, the left postcentral gyrus being smaller than the right, and the right pyriform so being somewhat larger than the left. The brain weight, 1240 grm., must be regarded as approximately normal for the case. There was a masculine distribution of hair upon the trunk and limbs.

On the whole, it would seem that, although the carcinoma may have influenced the symptoms, or even determined the occurrence of this fatal attack, the general history of the case and the appearance of the brain would suggest we are dealing possibly with a periodic form of dementia praecox.

#### V. SUMMARY AND CONCLUSIONS.

The writers present a sketchy review of the present relations of tumor research to psychiatry, pointing out the special value of teratological conclusions and brain tumor work to psychiatry. The writers wish all brain tumor cases carefully examined by psychiatrists to be published for the purpose of corroborating or modifying the conclusions of Schuster as to correlations between tumors in various brain parts and mental symptoms. Reference is made to recent work on symptomatic psychoses and to various other pieces of work showing the close relation of oncology to psychiatry as found in the volumes of *Zeitschrift fuer Krebsforschung*.

The writers believe that less than 3 per cent. of routine autopsy material of State Hospitals for the Insane will show tumors of the brain. The figures for non-neural tumors stand at 3.9 per cent.; allowing for errors and omissions of diagnosis, 4 per cent. may be given as a roughly approximate index of the number of non-neural tumors in insane hospital autopsies. It is clear, accordingly, that brain tumors are of some importance in the causation or liberations of mental symptoms. Special lists are made of 20 gastric carcinomata, 6 intestinal, 10 uterine, and 6 mammary, occurring in the Boston and Danvers series. A study of mental symptoms displayed by cases possessing or developing non-neural neoplasms has been made, from which it is clear that certain symptoms stand higher and lower than they do in mental diseases at large. For example, *incoherence* stands high in these cases, emphasizing the frequency of *delirium* in the group. *Depression*, on the other hand, which has frequently been stated to be a major symptom in cases of intestinal disease, stands low in the cancer list, although it stands exceedingly high in a list of symptoms derived from 17,000 living and dead cases (Danvers State Hospital). The symptom *sicchasia* (refusal of food), comparatively low in the 17,000 miscellaneous cases, stands out prominently in carcinoma cases. *Insomnia* is surprisingly low in the psychopathic cancer group. *Pain* is not at all frequent in these cases. Cancer cases seem to have shown a marked exhibition of delusions with respect to food and with respect to members of the family. The ideational reactions to the world of these cancer cases are on the whole of an unpleasant nature, despite the comparative infrequency of *depression*.

The writers present 7 cases in which it might be thought that the cancers had close relation to the development of mental



symptoms. Two of these are from the Psychopathic Hospital, Boston, one of which (Case VI) is most suggestive; but even in Case VI there were brain lesions of an acute nature, which may have complicated the picture. The second Psychopathic Hospital case (Case VII) was one in which the pancreatic carcinoma with its metastases may perhaps decidedly have influenced the symptoms in the fatal attack, but the case can be demonstrated to have been decidedly psychotic at the outset.

The remaining 5 cases (Cases I to V) are from the Danvers and Boston series. The correlations in Case I are fairly close in point of time and in simultaneous occurrence of physical signs of gastric cancer. The correlations in Case II are somewhat suggestive and the hypochondriacal delusions ('stomach full') are striking. Two cases of esophageal carcinoma appear to illustrate the general tendency of carcinoma, or infection derived therefrom, to produce delirium or phenomena of the 'exhaustion' group of the psychiatrists. Case V was a case of toxic delirium, apparently somewhat closely related to developments in a sarcoma of the jaw. The correlation is very possibly between infection from ulcer and mental symptoms.

Out of 68 cases of non-neural tumor found in the Boston and Danvers series, some 16 might be thought to show possible oncogenesis of the mental symptoms. A study of these 16 cases quickly shows that the 5 enumerated above were the only ones in which the correlation was at all convincing. The cases in question show phenomena possibly related to infection of ulcerative cancer surfaces with some instances of a delusional coloring related to the tumors.

On the whole, accordingly, there cannot at present be erected a very persuasive argument for the oncogenesis of mental disease, but certain mental symptoms may possibly be altered by carcinoma. In one instance (Case VI), a Psychopathic Hospital case, the predominance of neurological symptoms in the vagus region of supply directed attention to the probability of the gastric carcinoma found at autopsy.

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## SARCOMA AND SARCOMATOID DISEASES OF THE SKIN.\*

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By M. F. ENGMAN, M. D., of St. Louis.

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The group of sarcoma and sarcoma-like diseases of the skin is a large one as far as the individual members of the group are concerned, but fortunately their occurrence is comparatively rare. They are of much importance didactically on account of their relationship to the blood-forming processes and their histopathological classification. The relative position of the various members of the group in these two respects is at present in a chaotic condition, as investigation through differential and selective staining, the study of the blood, and critical survey of the literature have overthrown most of the former ideas in relation to them. Until more of this work is done, no one is in a position to express a positive opinion; therefore, any article upon this subject, to be at all concise, must be largely speculative.

The sarcoma and sarcoma-like disease of the skin may be divided into (1) fibroblastic or true sarcoma; (2) lymphoblastic or those new growths composed of lymphoid or lymphoid-like cells; (3) sarcomatoid (sarcomatous) or those new growths which partake of the characters both of the fibroblastic and lymphoid, to which are added the results of productive inflammation sufficient to class them with the granuloma.

(1) *Fibroblastic Growths or True Sarcoma*.—True sarcoma of the skin may be primary or secondary. The secondary sarcomas are the more frequent and occur as metastatic growths from primary sarcoma of the internal organs. Those of the testicles are particularly prone to metastasize in this way.

Primary sarcoma of the skin may be single or multiple, pigmented or non-pigmented. According to Johnston\*\* all true sarcomata of the skin are fibroblastic and may spring from the connective-tissue of the corium or subcutaneous tissue, or from the adventitia of blood-vessels. Macleod asserts the latter derivation is impossible in the corium as the vessels are simply capillaries. Johnston, who has made a careful and instructive study of the morphology of sarcoma, asserts that the large round-celled sarcomata are almost invariably endotheliomatous, while the small round-celled are lymphoid in character. He simplifies the matter by dividing the fibroblastic or spindle-celled into two clinical varieties—one in which the tumor process occurs in a single patch and one in which it is disseminated and the growths rarely attain a large size. The patients perish from cachexia. These tumors are not necessarily fatal; patients have been known to live with them for years, especially when they take on a myxomatous degeneration. Johnston states that fibrosarcomata have a predilection for the extremities,

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\*From the advance sheets of the author's book, "Treatment of Diseases of the Skin," to be published by P. Blakiston's Son and Company, Philadelphia.

\*\**British Jour. Dermat.*, 1901, p. 242; 1905, p. 23.

and the myxomatous for the abdominal wall and adjacent portion of the thighs.

The pigmented types of sarcoma are far more malignant than the non-pigmented, especially when the pigment is autochthonous. The giant-celled type is usually of bone origin. Like in epithelial growths, the more the component cells of a sarcoma deviate from their functioning properties or typical cell formation, the more malignant they are, as the cells proliferate more rapidly and the vascular channels which ramify all through the growth have thinner walls and are less protected from invasion, and, therefore, hematogenous metastasis, which is the rule, occurs more quickly in other parts and organs and destroys the patient.

The cells of sarcomata are subject to great morphological change from time to time, so that they may appear "spindle in one part and round in another" (Johnston). Therefore one must remember that the shape of the cells and other features are subject to variations from transient conditions.

The fibroblastic or spindle-celled sarcomata develop in the corium or subcutaneous tissue and are seen in the form of plates or nodules pushing upward through the skin, giving the lesions a congested or pinkish hue. They are firm to the touch, and are movable with the skin if they are not too large and too deeply attached. The skin may be movable over the growth if its origin be deep in the subcutaneous tissue. They may vary in size from a bean or smaller to various sizes, or run together and form plate-like and nodular masses. They may grow outward, become denuded and ulcerate and fungate.

Hutchinson describes a peculiar type. It begins usually in the lowest extremities, grows slowly at first, but recurs rapidly and persistently after removal, however wide the incision, and ultimately generalizes, fungates, forms blood-cysts and destroys the patient.

Perrin's type is a round-celled sarcoma with a few spindle cells. It begins in the hypoderm as a single tumor which steadily grows and destroys the patient in less than two years.

Both the primary and secondary sarcoma may become pigmented, but the growths of this character, usually spoken of in textbooks upon skin diseases and general pathology, are treated of here under melanoma and the other pigmented growths under the third group in this section.

It is a question in the study of multiple sarcomata whether the multiple foci be due to metastasis or to the 'stimulus' (whatever this may be) acting at several points simultaneously or consecutively. As will be seen when the lymphoid growths are discussed, the latter theory is probably the most plausible.

Sarcomata of the skin are usually divided into round-celled; angiosarcoma, when unusually vascular; myxosarcoma, when this form of degeneration occurs in its meshes; fibrosarcoma, when the fibrous element is marked; lymphosarcoma, when the lymphoid element predominates (to be discussed later). Various other divisions are made according to the opinion of the author. In this, as in many other respects, there has been a great propensity among authors to divide and subdivide, name and rename upon the slightest pretext of cell-form, location, and depth of tumor, clinical appearance or histological deviation.

Usually the shape or type of the tumor cell portends as to



malignancy, so does pigmentation, differentiation of cell, etc., but frequently these factors have no relation whatever to the prognosis.

The etiology of sarcoma is unknown; trauma seems to be an etiological factor in some cases. The subject is very well epitomised by Hartzell when he says, "the sarcoma known to the surgeon differs very widely from the sarcoma of the dermatologists."

(2) *Lymphoblastic Growths or Leukemia and Pseudoleukemia Cutis*.—The various clinical conditions included in this group are closely related to the blood-forming organs and therefore to those diseases of the blood classed as leukemic and pseudoleukemic. As the predominant cell in leukemia cutis\* is the lymphocyte, many of the tumors are spoken of as lymphosarcoma.

There is still some difficulty in drawing definite conclusions just as to what is leukemia and just as to what is pseudoleukemia, as there are so many various clinical types. We must, however, admit a typical leukemia and an atypical leukemia. Of the first, there is a myeloid and a lymphoid type. Of the second, or atypical, there are various and confusing conditions which have contributed to the chaos in this group of skin diseases. Somewhat after Cabot\*\* we, for practical purposes, can here look upon the atypical group as follows: (1) Leukemic changes in the hemopoietic system without leukemic blood (pseudoleukemia proper); (2) tumor-like growths of hemopoietic tissue (lymphoid tissue) with or without leukemic blood.

I believe we can understand the skin changes in the diseases or disease (?) under discussion if we bear in mind the fact that the tumor-like growths of lymphoid character are a distinct entity and should not be confused with the true types of sarcoma proper (just described), nor with the conditions soon to be described which are not connective-tissue-celled sarcoma, but sarcoma-like; not lymphoid-celled, but lymphoid-like; not purely granulomatous, but partake in many instances of the characteristics of that form of growth—lymphogranulomatosis and certain types of Hodgkin's disease and sarcoid.

The tissue here shows a pure lymphoid character, and as Cabot says is the result of leucocytic hyperplasia which in all cases of leukemia is the essential change in the hemopoietic system and may begin in any part of that system, glands, marrow, skin, in any nook or corner of the body wherever the lymphatics may extend. It springs up first here, later there, and the disease in one part does not cause the disease in another part. The 'stimulus' of growth which started the parent growth may be exerted upon some of the innumerable minute foci of leukoblastic tissue scattered through every organ and tissue of the body, therefore indistinguishable from metastasis. We see then that the stimulus which causes an increase in these cells can act primarily upon lymphoid tissue of the skin and gradually extend its influence to other tissues, and if the process is slow and remains localized in the skin, or the skin and glands for some time, there may not be sufficient production of cells washed into the blood-stream to cause the blood-picture of leukemia; in which event we have an aleukemic skin disease—local histological findings only can point to a proper diag-

\*The myelocyte is very rare (myelogenous leukemia).

\*\*Osler's Modern Medicine, Vol. IV, p. 673.

nosis. If the patient does not succumb to some intercurrent infection, nephritis or pulmonary edema, the blood-picture of leukemia will eventually supervene. On the other hand, if the leukemic process begins in some other organ, the skin may become involved later.

If the leukemic process be localized in the lymphoid tissue or lymph-glands of the skin and if its action be limited to a certain area or be disseminated, involving several areas at distant points and causes a rapid local increase of cells, they may break through the capsule or capsules and infiltrate the neighboring tissues. In this event, we have the process known as leukosarcoma (Sternberg and Warthin)\* or lymphosarcoma, lymphoma malignum, etc.\*\* Associated with these cutaneous phenomena we may or may not have the picture of leukemia in the peripheral blood. If myeloblasts are formed instead of the lymphocytes, the resultant tumor is the so-called giant-celled sarcoma.

To sum up, we might say that we have leukemic and aleukemic skin diseases; lymphoid and also myelogenous (very rare) cell growths; a regional and general distribution of the process.

Built upon the facts just given, there is an appalling literature with the usual innumerable and memory-splitting names. Space will not permit us to enter upon this alluring discussion; therefore, we must be satisfied at present with two facts in the elucidation of the leukemic and pseudoleukemic skin diseases. (1) That the 'stimulus' may cause in the skin, primarily or secondarily, such an increase of the leukoblastic elements that they may appear to the clinical observer in form of papules and nodules, large or small, few or many, localized or disseminated; as plate-like lesions, localized or disseminated, from which may spring large lymphoid tumors which may break down and ulcerate or fungate; as diffuse infiltration of a large extent of skin surface with swollen folds separated by deep furrows, the whole of the face, for instance, may be involved; as tumor growths of various forms and sizes, single or multiple. In any of these types ulceration and fungations may occur.

(2) During the course of the disease there is a slow but gradual disintegration of the excessive white blood elements in the blood and tissues, which no doubt causes certain toxic phenomena through the liberation of autolytic and other enzymes and poorly split-up products which are introduced parenterally into the circulation and tissues, together with the results of the impaired metabolic activity of the system. Through the influence of these conditions various forms of toxic eruptive lesions may occur: pruritis; urticaria; dermatitis (eczema) at sites of trauma, which may become like any other dermatitis, generally distributed and form a type of general exfoliative dermatitis; purpura; pemphigoid eruptions (Anthonis' case); pityriasis rubra-like conditions.

None of the second class can be differentiated from eruptions of the same objective clinical characters, due to other causes, except by a careful study of the blood, while the diagnosis of the first class can only be confirmed by histological study and also repeated blood examinations, the former being the more important.

\*There is a type described which tends more to the granulomata—lymphogranulomatosis.

\*\*If they do not infiltrate they are called benign, but as Warthin says, they are all progressive.



In the study of the histologic sections of the skin of the toxic group, one would expect to find an increase of the cells of the lymphoid tissue normally present and overlook the more important changes in the epithelium and papillary body, which point to other origin than the leukemic process, as increase of lymphoid elements have been found by Kreibech in macroscopically unchanged skin in leukemia. It is very probable that the intense pruritis which not infrequently is the first clinical symptom of the beginning leukemic process may be due to the slight increase of the cells of the lymphoid tissue of the skin.

Pigmentation which is a frequent concomitant symptom is frequently due to diapedesis, the poor condition of the vessels, and low coagulability of the blood.

The toxic eruptions can be produced almost at will in certain cases by a slightly excessive dose of the x-ray in any marked form of leukemia. These appear as urticarial and polymorphic erythema lesions and are no doubt caused by the disintegration of a large number of white cells and the liberation thereby of toxic enzymes and other abnormal products.

We have tried to outline in a general common-sense way the relative position of the cutaneous conditions which are associated with a leukemic and so-called pseudoleukemic process. We must realize that with a purely inflammatory process we have a certain increase of the lymphoid elements of the skin and by diapedesis from the blood, and that certain conditions induce a temporary and relative increase in the lymphocytes of the peripheral circulation and an absolute leucocytosis. Therefore to place a pathological condition in this group, repeated confirmatory hematological evidence is necessary. When the well-known elements of productive inflammation make their appearance in the histological picture, the process must necessarily be relegated to the group of granulomata. The members of the granuloma group are rapidly increasing and differential staining is adding to its members daily at the expense of the sarcomata. Improved histologic technique is slowly robbing the sarcoma and leukemic and pseudoleukemic groups. Clinically, however, many of these distinct entities look alike; for instance, it is impossible to differentiate, clinically, disseminated infiltrated patches of leukemic skin which form fungating or ulcerating tumors from mycosis fungoides (a distinct entity). It can only be done by a careful study of the blood. Histological differentiation can only be made in the earlier infiltrated patches.

Similar clinical pictures in many processes and loose clinical methods of investigation have naturally caused much confusion and unnecessary names and differentiations.

From the trend of modern investigation we must look upon leukemia as malignancy of the hemapoietic system, using the term 'malignancy' in its most restricted sense, as applied to cancer. In other words, it is probably a cancerous process of the blood-forming organs, and clinically and biologically it seems to follow the same general laws.

(3) *Sarcomatoid or Sarcoid*.—The name 'sarcoid' (sarcoma-like) is at present a very convenient one, as under this term one may at present safely place certain growths of doubtful histological, clinical and etiological characteristics. The word was first introduced by Kaposi to include certain diseases whose "path-



ologico-histological character is undecided, some regarding them as inflammatory tumor formations, others as tumors in the stricter sense and included among the sarcomata." The name suits its purpose now even better than it did in his day. Somewhat after Kaposi we will discuss the following conditions under this group: (1) Multiple idiopathic pigmented sarcoma (Kaposi); (2) sarcomatosis cutis (Kaposi); (3) mycosis fungoides (Alibert); (4) multiple benign sarcoid (Boeck, Darier).

The more careful modern clinical methods of investigation are applied to sarcoma-like processes of the skin the larger this group becomes. Its dermatological importance is largely unknown to the general pathologist, yet they recognize similar processes under other appellations.

We now recognize that cell-increase of a granulomatous nature simulating sarcomata can be induced by various agents, micro-organisms (particularly the tubercle-bacillus\* and spirochæta pallida); chemical bodies; mechanical irritation or foreign bodies (sand and oyster-shells, Dubrenill and Venot); camphor oil injections in one of my cases. This has caused some doubt to prevail as to the true nature of some of the experimental animal sarcomata. Are they true sarcoma or granuloma?

It is impossible, at present, to outline the limitations or to state, in a general way, the histological characteristics of the sarcoids further than those already given in this chapter. The clinical conditions to be outlined here are those included in the above classification and those spoken of by various authors as occurring with Hodgkin's disease proper, which is not a pseudoleukemia but a lymphoma due to some definite infectious process which does not induce the blood picture of a leukemia—it is not pseudoleukemia or a leukemia without leukemic blood (an aleukemia), but a distinct chronic inflammatory process. For obvious reasons it is far better to consider it as such at the present time. The eruptions besides the glandular enlargements are those that one would expect from a general infection: pruritus, papular eruptions, urticaria, granulomata of various types.\*\*

It is absolutely impossible at the present time to differentiate the eruptions associated with Hodgkin's disease in its modern interpretation from pseudoleukemia proper. Several types supposed to be Hodgkin's disease clinically have proved to be of tuberculous or syphilitic origin.

\*Steiger (*Zeitschr. fuer klin. Med.*, Vol. 79, Nos. 5 and 6) believes the bovine type of tubercle bacillus to be the cause of human lymphogranulomatosis.

\*\*The local eosinophilia and histological picture makes it a distinct entity. The micro-organism of Fraenkel, Bunting and Yates and others should be more fully confirmed.

## CARCINOMA CUTIS AND ITS CURE BY ROENTGEN RAYS. A SOFT RAY TECHNIQUE.

By JAMES N. MCCOY, M. D., of Vincennes, Ind.

The primary object in the treatment of cancer is, of course, to save life. The secondary object is to cause a disappearance and cure, without destruction and resulting scar. It is the writer's purpose to discuss in this article, cancer of purely superficial character, and that which he believes to be the best known treatment for it.

These lesions arise in and primarily attack the epithelium, hence the term 'epithelioma.' The use of this term, however, is to be decried. It is in many instances a misnomer, and fails to convey to the laity and to some medical men the true character of the disease, and fails to arouse a full sense of the gravity of the malady.

The disease is insidious in its early stage, when by lack of pain and disfigurement it fails frequently to alarm the patient and for the same reasons may fail to awaken the family physician to the horrible possibilities of the case. In this stage some family physicians are inclined to temporize, to await developments, to take further time to assure themselves of the diagnosis, to use astringent, antiseptic and even caustic remedies, all of which serve to stimulate the lesion to increased activity. Not every good general practitioner has had the misfortune to be compelled to deal with this disease in its later stages, but the writer ventures the assertion that some good results from such an unhappy experience, and that having seen a case of carcinoma cutis go to a fatal termination, he will be horrified for the remainder of his life and will evermore be awake to the gravity of skin cancer, and the necessity and desirability of seeing the case brought early under proper treatment. Strange to say, while every medical man is alive to the question of internal cancer, many, or at least too many, are lethargic with regard to skin cancer. The facts and the history of the two forms do not justify this. An internal cancer untreated, is decidedly to be preferred to a badly treated external one. Cancer is on the increase at a rate which is simply appalling, and were it not that it has been more successfully treated within the past few years, the death-rate from it would be correspondingly appalling, and every physician should do his or her part in a general awakening on the subject.

*Origin and History.*—The origin of cancer is still shrouded in mystery. No substantial theory has been advanced since that by Cohnheim in 1877. Pilcher modified and better stated this theory a few years later, and this remains to this day our only working basis. This, at best, is a lame theory. By it we are forced to believe that the displaced fragment of germinal matrix in embryonic life is the source of all neoplasms and keratoses, for cancer supervenes on keratoses and moles in such numerous instances that we are forced to believe there is at least a remarkable predisposition and possibly some close relationship between the malignant

and the benign. Moreover, the Cohnheim-Pilcher theory does not account to us satisfactorily for the many cases of carcinoma cutis arising at the site of injuries.

*Prevention.*—It is to be hoped that pathologists of the present or near future will succeed in determining definitely the cause of cancer. When that much desired object is obtained, we shall possibly be able to do something really effective in preventing the disease or checking its enormous increase. Until that, however, we have no means of prevention other than removal of papillomata and keratoses, and nævi. These may be removed by excision, cauterization, electrolysis, Roentgen rays or electrical dessication (method of W. L. Clark), of which the latter method is by far the best. This accomplishes the destruction quickly, with very little pain and leaves no scar, and when such is the case there is no excuse for retaining these abnormal growths. If there be doubt as to the character of the lesion and a biopsy is not possible, the *x*-ray treatment should be resorted to for the reason that the destruction necessary in case of a doubtful lesion would certainly be great enough to leave a permanent scar which would be obviated by the *x*-ray treatment. The esthetic reasons for removing them are sufficient, even if they were not a known source of danger, which they admittedly are.

*Diagnosis.*—There are certain salient features of carcinoma cutis which make its diagnosis easy, sufficiently early for it to be amenable to treatment. It is a single circumscribed lesion. In the first stage it shows as an elevation of pearl-like appearance, while in the second stage there is a central, depressed slough surrounded by an elevated rolled border having a glistening appearance resembling pearl. A biopsy is, of course, to be commended, but it is not always possible to procure the necessary pathological specimen, as many of these patients will not permit the necessary cutting. If a specimen be taken from the lesion, it should not be done without an understanding with the patient that if microscopical examination result in a diagnosis of malignancy, treatment shall be instituted at once, as the disturbance of the growth always acts as a powerful stimulus and results in immediate and rapid increase of growth with consequent danger of metastasis. Rodent ulcer appears as a round, scooped-out ulcer, with perfectly regular edge and smooth surface, and is attended with great pain. The pearl-like border which identifies carcinoma cutis of other types may be very slight in rodent ulcer, and is usually entirely wanting. It is an ulcer of chancroidal type. The fact that it is practically always subjected to and has obstinately resisted antiseptic and astringent treatment, may be considered as an aid in diagnosis. Though it is least dangerous of all the forms of skin cancer, being less prone to metastasis, it is the one which receives attention earliest on account of the pain.

*Treatment.*—The *x*-ray treatment for deep-seated carcinoma is essentially a hard ray treatment. In that case the soft rays are disposed of by means of a filter. In that case the cancer is beneath the skin in varying degree, and the object of the hard ray, or filtered massive dose technique, is to reach the cancer through the skin with the least possible *x*-ray effect on the skin, which in that case is healthy and requires no *x*-rays in any form. The filtered massive dose accomplishes that purpose. The *x*-ray treat-

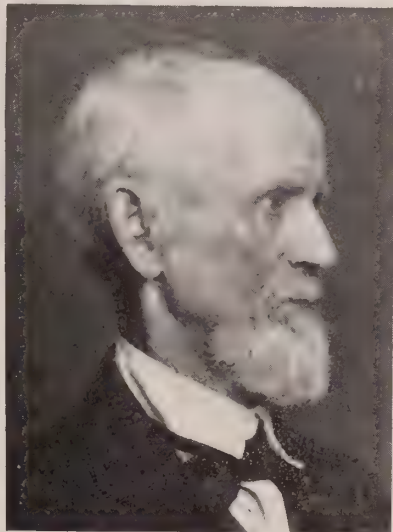
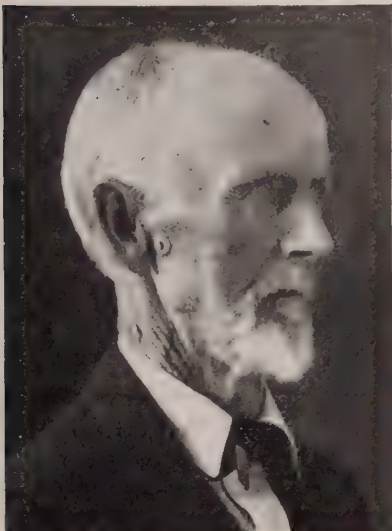


ment of cancer of any structure beneath the skin would therefore require a filter even though the cancer be located *immediately* beneath the skin. In the treatment of cancer of the skin, however, we have a different object. Since the depth of the cancer is limited to the depth of the skin, it is desirable to use only the soft, or less penetrating rays, and thereby avoid any unnecessary effect on healthy tissues beneath the skin, while administering a curative dose of the rays to the malignant lesion. The writer believes the cure of carcinoma cutis by *x*-rays may be accomplished in two ways: First, by administering a sufficient dose to cause a destructive inflammation; second, by administering a physiological dose, with the object of depriving the cancer cells of their power to assimilate glycogen. This effect and a cure can be accomplished with a dosage of rays which is insufficient to produce more than a slight skin reaction. This was done by the author, prior to the discovery of radiometers, by using a daily dose of soft rays at a focal distance of 12 in., and either stopping treatment or increasing the time between treatments as occasion demanded, when an erythema first appeared surrounding the lesion. The writer now attempts to secure the same result and a cure with a single measured dose. In occasional cases the disease will not entirely disappear and an additional dose is necessary.

The armamentarium necessary or at least preferable for this technique, is a soft tube, a transformer, a tube stand with protecting shield and a Sabouraud (modification of Bordier), or Holz-knecht radiometer. The tube should not be higher than 4 of the Benoist scale and preferably of a 7 in. diameter. The smaller tube is very serviceable for this treatment, and enables the operator to reduce the focal distance and thereby shorten the time necessary for administering the desired dose. For focal distance means the distance from the anode to the objective treatment field. In many instances, by using the small tube, the focal distance can be reduced to 5 in. No discussion should be needed as to the merits of the transformer over other apparatus, as the induction coil and static machine are practically discarded on account of the general mechanical superiority of the transformer. The Sabouraud radiometer is desirable for this purpose because it is much easier to read than the Holz-knecht. It must be admitted that the graduated scale of the Holz-knecht is very difficult to read, while the Sabouraud is easy. A much greater dose may be measured on the Holz-knecht than on the Sabouraud, but in the opinion of the writer a dose greater than Tinte IV Sabouraud, which can be read on the Bordier modification, is not proper in the treatment of cancer of the skin. The fact that the Sabouraud radiometer has but 4 steps in its scale leaves room for slight conjecture, while the Holz-knecht instrument permits the dosage to be read to a nicety if the reader be a color expert, but the chance for error in the use of the Sabouraud scale is so slight as to be negligible. A reliable milliampèremeter is a necessity, but the essentials of this technique, a low tube, short focal distance and measuring the *x*-ray dosage, make it unnecessary to use a qualimeter. Under the conditions named, the treatment is so short that such change as may occur in the vacuum of the tube is of little consequence to the operator and none whatever to the patient.



CASE I.—J. L. M., male, *æ*t. sixty-eight, carcinoma on left side of face in front of ear. A large projecting fungating and sloughing tumor. Duration one to two years. Originated in what the patient called a wart. Treatment begun May 3rd, 1912. Interrupted soft ray dose was used and discontinued when an erythema appeared on the healthy skin surrounding the tumor. Tumor disappeared leaving no scar.



CASE II.—E. V., male, *æ*t. seventy-three, carcinoma of face, exactly resembling Case I. Duration four years. Originated in a keratosis which the patient described as a yellow blotch. Treated December 6th, 1913. The filtered massive dose to entire side of face was used in this case, as metastasis was feared. The tumor disappeared leaving a permanent scar.

CASE III.—W. W., male, *æ*t. seventy-two, carcinoma on right side of face in front of ear. Duration four years. A typical lesion with elevated rolled, pearly border and slough in centre. No history of any precancerous lesion.

Treated October 7th, 1914. Soft ray dose measuring Tinte IV, S. Reaction, erythema. Latent period seventeen days. This patient was not susceptible to *x*-rays and on November 7th, 1914, was again treated. Soft ray dose, Tinte IV, S. Reaction, deep erythema. Latent period fourteen days. The cancer disappeared leaving no scar.

#### CONCLUSIONS.

1. The use of electricity by the method known as dessication, originated by Dr. W. L. Clark, marks a great advance in the line of preventive medicine. Warts, moles, *nævi* and keratoses should be removed. Keratoses are also removed with equal facility by the roentgen rays. If there be doubt as to the character, whether a keratosis or carcinoma, the *x*-ray should be used.

2. Roentgen therapy has been accorded a permanent place as a life-saving agent. The filtered massive dose is a valuable aid to surgery in deep-seated cancer, while the soft ray dose is so valuable in superficial lesions that it has that field to itself. It is the remedy *par excellence* for cure of skin cancer. It is safe, it is painless, it is sure, and it leaves no scar.

3. Carcinoma cutis is a life-destroying malady. It is increasing more rapidly than internal cancer. It should be accorded the liveliest consideration and dealt with as promptly as possible. "Procrastination is the thief of time," and this same malefactor together with caustic applications to skin cancer has stolen thousands of lives.

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## EDITORIAL.

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### WHEN MICROBES ARE HIS ARGUMENT.

There have been many explanations before now why some men write poetry and some men murder their wives. And there have been many explanations before now why our neighbor, whom we heartily dislike, is a boor, a fool, a failure, and why on account of his ancestry he can never approach our exalted mental status. But whether we consulted men of science to explain these many vagaries so characteristic of human nature or mere literary men who were ignorant of science but who had probed deep into the dark recesses of human nature, no two would or could agree as to the cause. Hence we were left at sea, and great was our mental depression; for if there is anything more depressing in this best of worlds than not to know the true cause of our extreme sanity and our neighbor's insanity, why genius swept past our door and crept into the door a short distance off, or why we have a soul above carrying a hod though our father may have delighted in carrying one, we have never experienced the sensation. But the dark clouds, portentous of complications never to be unraveled, which have heretofore obscured the blue of our mental skies, have been dissipated as if by magic, and thanks to Dr. Robert T. Morris in his book "Microbes and Men" (Doubleday Page and Company, New York) we are now in a position to know what we have longed to know these many years—namely, why some of us are fools and some of us are geniuses, why some of us are jolly and some of us are misanthropes, and finally why some of us on returning home after a hard day's work are not kindly disposed toward our wives and the children and the usual cold leg of lamb, and why some of us after a hard day's work are given to singing the virtues of our wives

and the remarkable qualities of our children and the succulence of the cold leg of lamb in tones of supernal sweetness!

According to Dr. Morris, the microbe, so long immured in the surgical wards of our hospitals, has seen fit to extend its province; and what more natural than that with this ambition as a propelling force it should at once develop into a Superman to dominate the whole world. Here is not the "blond beast" of Nietzsche, but a wee beast that has such extraordinary powers to make or unmake us that autocratic rulers ought to hide their heads in shame on account of their puerile and futile efforts. And for that matter eugenists and all reformers of decrepit mankind should cease their labors, for no matter how careful they may be in the selection of parents for a future progeny on eugenical lines, their efforts will fail, for the ubiquitous microbe will destroy what they have so carefully builded, and instead of a poet, a philosopher, an asset to the respectability of the world, a little murderer may be the result,—that is if the wrong microbe enters the babe's system. And who can ward off the wrong microbe—what human hand is deft enough, what germicide is strong enough, what human eye is alert enough!

"A man is only what his microbes make him," says the author. Immanuel Kant, you who labored for years over your "Critique of Pure Reason," Buckle, you who wrote with painstaking exactness your "History of Civilization in England," Carlyle, you who wrote in your mordant way your "French Revolution," what would you say to this were you living to-day? Would you stop writing your histories and exclaim *cui bono* and take to the field and plow the hard, unyielding earth, or would you destroy what you had written and start anew and write your "Pure Reason," your "History of Civilization," your "French Revolution" from a microbic standpoint? Think of the simplicity of your work, Carlyle, you who worked your mind into snarls in your attempt to explain the thirst of Marat, Robespierre, and Danton for the blood of royalty and the aristocracy. Would you not recognize at once that all these rabid revolutionists, these demagogues, were intoxicated by the *bacillus moribificans sanguinaris*, and could be explained and excused for their acts by the lightsome and fascinating phrase that "a man is only what his microbes make him," instead of by outpourings of long and complicated sentences?

It has been said by quite a number of people who read with some discrimination that they are a bit weary of the theories contained in modern books and that they hope the day is not far distant when simplicity will again reign supreme in novels, in books on history

and philosophy and on the many subjects which the patter of to-day calls 'social problems.' If any of these readers who have expressed this unfulfilled wish should chance upon Dr. Morris's book, we have no doubt their desires will be appeased, for it makes for simplicity and the sort of writing that is direct and to the point. Here are no philosophic dimnesses to keep us guessing, no involvements of phrases that indicate turgescence of thought, but a gentle and benign flow of limpid explanations that o'erspreads each page seemingly without the slightest effort. No doubt, the weary reader, who is so bitter against modern books on account of their intricacies of word or thought, has often gone to them for solace and in hope of explanation as to why he always had to stand treat in a saloon or restaurant when with his intimates, why his dearest and best friend allowed him to enter the street car first, and why even when there were opportunities to reciprocate on other occasions his dearest and best friend refrained from hurting his feelings by sending him a small gift. Happily for mankind the author explains similar distressing situations in a few words; for on page 407 he says: "Fifty per cent. of the people walking up Broadway at this moment, —or Piccadilly, or Unter den Linden, or the Boulevard des Italiens, —are distinctly and abnormally impressed right now by some microbic toxin in excess. Every remaining individual (making one hundred per cent. of the whole) is influenced to some degree by the microbe, beneficially or harmfully as the case may be."

Dear reader, as Miss Bronte says in her novels, what sort of microbe has your dearest and best friend who continually holds back? Surely not the microbe that beset Strindberg, the *bacillus divinogenes capsulatus* of the author's book, or the "special microbes [which] at the same time took a trick at the wheel and gave direction to his [Shelley's] thoughts.

P. S.

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### THE MINOR HORRORS OF WAR.

The major horrors of the present war are familiar to all of us, having been limned by correspondents who are safely ensconced some hundreds of miles from the firing-line. Not a day passes but some imaginative writer tells us in the newspapers or in the weeklies or monthlies, just what he saw from his coign of vantage, which is generally a nicely furnished room near the great boulevards of Paris, or 'somewhere in France,' as the phrase goes, but always near enough to a large city to insure comfort and three good meals a day. But the minor horrors of war have been neglected: those exasperating occurrences which deprive a man of his faith in his



fellowmen as regards personal cleanliness and unseat the almost invincible belief that with the many advances civilization has made in the last hundred years we no longer are on friendly terms with the variety of parasite which found a haven of complete rest under the wigs of the *grandes dames* and *grands seigneurs* of France during the reign of Louis XIV. Reference is here made to the louse which, we take it, is also afflicted with the war-like spirit, for the havoc it has wrought in Servia and elsewhere by causing typhus fever indicates that it is no craven in the matter of asserting its rights to kill when on all sides the killing process is developing as a fine art.

In a book that has recently come to our desk—"The Minor Horrors of War" by Dr. A. E. Shipley (Smith, Elder and Company, London) there is much of interest to follow, but what enlists our attention to the highest degree is that the bedbug, so loathed and feared in former days, comes out of the severe test with what might be called flying colors, so innocuous and respectable has it become. But it is an altogether different matter when the author lays his ungentle hands on the louse, for this parasite is shown as being a typical Hun who, when he starts on the grand tour around the body, has no respect for our treaties with cleanliness and no regard for our desire to keep healthy. As a carrier of disease he stands supreme, and though in the latter part of the eighteenth century he made so deep an impression on a Scottish poet that he described him in poetical terms that encased much philosophy, we doubt if even the most romantic poet of to-day—that is if he knows as much about the parasite's nefarious designs on man, as does Dr. Shipley—would pause for a moment behind the most bewitching lady to contemplate his movements and to philosophize a bit, even though the surroundings had the respectability and sanctity of a church. But other times, other manners; and to-day the louse is the scorned of scorned, and the bedbug, that never moved a poet's Muse to rapture and was condemned by all in terms that smacked of brimstone, is rehabilitated into the respectable citizenship it lost;—shall we say on account of prejudice?

But the parasites which we have mentioned—and in their company are flies and mites—are not the only minor horrors of war to contemplate, for if we are to believe M. Berillon and his communication in the *Bulletin et mémoires de la société de médecine de Paris* of the 9th and 23rd of April, there is a horror, especially for the French soldiers, which is the greatest of all. All of us perspire at times and all of us are not scrupulous in the matter of of-

fending the nostrils of those nearest to us. It is one of the delightful and unexplainable facts of human nature not to be able to detect our own odors, but to be extremely susceptible to those emanating from others. Dean Swift has a very vulgar comment on this weakness, so vulgar, indeed, that even these outspoken pages would blush at the mere mention of it. Now, according to M. Berillon, the asphyxiating gases of which we have recently heard so much are as nothing compared to the fetid perspiration peculiar to the German soldiers; and greatly he deplores the fact that the sensitive and refined Frenchman should be subjected to it almost continually. The objectionable and constant perspiration is due, he says, to the Teutonic egomania which causes the nervous system to over-stimulate the secretory functions; and what with the Berserker rage that is always at high tide in the Teuton in times of war, the secretory glands are doing herculean work. This is very deplorable, we must admit, and should give every Frenchman pause; but though we may admit the truth of the author's contention, is it not possible that when he penned his lines he, too, was in a rage and did a deal of perspiring and that when his countrymen read his essay they, too, will foam at the mouth and perspire very freely? And would not all this break down the line of demarcation between the non-perspiring Frenchman and the over-perspiring German, a line, we take it, that every Frenchman wants to uphold lest he, too, will be taken for a German!

The matter of cleanliness is one that has been argued from so many points of view that even to mention a few would entail too much work on the part of the writer and bore the reader unmercifully. Men have agreed as to what sort of food should be eaten for breakfast, for lunch, for dinner, but what two have ever agreed on the frequency of baths and the quantity of soap? And as long as civilians are still in a state of doubt as to what constitutes cleanliness, it is unkind at this time to belabor the soldier who lives in trenches, just because he is too busy avoiding death to pay the attention to his body, which we imagine is his wont in normal circumstances. And as for the critical spirit that decides the odors that arise from others and sweetly ignores our own, again it should be written that no great writer ever wrote on this subject so well and fittingly as Dean Swift.

P. S.

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#### LITERARY NOTE.

If we are to believe Mr. A. Corbett-Smith, the author of "The Problem of the Nations" (Paul B. Hoeber, New York), the real problem that is confronting us to-day is not a matter of literature,

of religion or politics, not a matter of land aggression, of military power or world supremacy, but a very old one that has been debated for years and discussed in writing by many medical men and, latterly, by many non-medical men. But the sexual diseases, despite what has been said about them in a kindly way and in a censorious way, are marching unhealthily onward; and though one nation may pride itself on having fewer cases than another nation, let not the too boastful nation be so cocksure of its league with morality and purity. Statistics are dreary reading, and are not read by most people with the avidity with which they read their newspapers or their favorite journals, but they are as near the truth as any calculation that is mundane can be; and with this virtue on their side they tear not gently the veil off hypocrisy and deceit. Mr. Corbett-Smith shows how nicely and evenly the sexual diseases are distributed and how foolish it is for any one nation to attempt to take unto itself the privilege of lecturing another on the subject of morality or on the blessed advantages of living in a country where things are managed so well by the government and the police that sexual diseases are a negligible quantity. The sanity that pervades this book is its best feature; and we would place it in the front rank of books on this subject, because added to its sanity there are other factors without which no book that has a message is really worth while: a dogged persistence to look things in the face and an absence of the sort of reform propaganda that ill fits in the life of men and women such as modern civilization has made them. The letter at the end of the volume, entitled "To a godson when he is 18 years old" is a masterpiece as regards calmness, candor, and knowledge of the world, and is written in language of rare simplicity and with the literary grace that is characteristic of the educated Englishman.

P. S.

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#### ERRATUM.

In the Special Cancer Number (July) the following misprint occurred on p. 693, line 25, of Maud Slye's article on "The Influence of Heredity Upon the Occurrence of Spontaneous Cancer": "(1) Pure breeding house-mice (heterozygotes); (2) pure breeding albinos; (3) mixed greys, which if inbred will yield the same three types in about the proportion of one pure grey to one pure albino to two mixed greys." The sentence should read: "(1) Pure breeding house-mice; (2) pure breeding albinos; (3) mixed greys (heterozygotes), which if inbred, etc. etc."



## ORIGINAL ARTICLES.

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### MOTILITY DISTURBANCES OF THE STOMACH—PRESENT STATUS OF DETERMINATION, ETIOLOGICAL FACTORS AND TREATMENT.

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By MAURICE H. GROSS, M. D., AND I. W. HELD, M. D., of New York.

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One of the essential functions of the stomach is that of motility. By motility we understand the power possessed by the stomach to move its contents into the small intestine. This is accomplished by the musculature of the stomach, and depends on the integrity of the nerves as well as the secretions.

In order to determine clinically whether there is normal or abnormal motility, it is essential to know the amount of time in which the organ should empty itself of a definite meal.

We speak of hypermotility when the organ empties itself prematurely, of normal motility when it becomes empty in due course, and of hypomotility when the process is delayed. Normally the stomach rids itself soonest of carbohydrates, later of proteids, and last of fats. The emptying of the stomach depends on the position the individual assumes after a meal; lying on the right side, or back, hastens the emptying. Emotion influences motility even in normal individuals, sometimes increasing, but usually delaying same. It is self-evident that in neuropathic individuals, especially in those of the vago-sympathicus type, motility is still more influenced by emotions.

The clinical methods of establishing a diagnosis of motility disturbances of the stomach are first, the old established methods of inspection, palpation, percussion and auscultation; second, by means of the stomach-tube; and third, by the *x-ray* examination.

By inspection, in thin persons only, it is possible to determine a very marked degree of hyperperistalsis; the peristaltic unrest is noted in such cases throughout the stomach. We can also determine a high degree of disturbance in the peristole of the stomach, manifesting itself in a stiffening of the organ (*magensteifung*—Boas). Both are manifestations of a hindrance to the outflow of the stomach contents, with the difference that the peristaltic unrest demonstrates that the musculature concerned in peristalsis, *i. e.*,

the pars pylorica and corpus, is trying to overcome the hindrance; while stiffening of the stomach is the result of a disturbance of the peristole, thereby allowing the food to distend the stomach passively, giving rise to a contraction of the musculature. Peristaltic unrest may sometimes be seen in thin, neurotic individuals with functional hypermotility, but stiffening of the stomach is always a sign of organic obstruction.

Palpation practically confirms inspection. In peristaltic unrest one feels, in thin individuals, vermicular-like movements of the stomach; where there is stiffening, the organ feels more tetanic, accompanied by vigorous action.

Palpatory percussion over the stomach reveals succussion, which is only diagnostic if obtained on an absolutely empty stomach, three hours after a fluid meal, or eight to nine hours after a solid meal. Under such circumstances we have reason to suspect that the tone of the stomach is weakened.

Percussion in itself is the least satisfactory method of examining the stomach. A more practical method is auscultatory percussion, by means of which a sound is obtained in the stomach region which is known as the 'splashing' sound, and depends on the fluid and air contained within the stomach. Before judging its diagnostic value it is important to know how long after a meal the splash is obtained, and the kind of meal the patient has taken. The splash obtained on an empty stomach speaks, in the great majority of cases, for a disturbed motility, provided hypersecretion can be ruled out. A splash in the stomach three or four hours after a fluid meal and eight to nine hours after a solid meal is an indication of delayed motility. In higher degrees of disturbed motility the splash may be obtained four to six hours after a fluid meal and even up to twelve hours after a solid meal. The extent of the area over which the splashing sound is obtained may furnish a clue as to whether the organ is dilated or ptosed. At its best the method is only of value when the splashing is very marked and obtained on repeated examination. In the case of emaciated persons, an occasional slight splashing sound exceeding the usual hours after a meal may be due to the additional function of the stomach described by Boldyreff,<sup>1</sup>—namely, the contraction and secretion that occur even in an empty stomach at regular intervals, every one and a half to two hours, and lasting for about half an hour.

A better method of determining motility disturbances is by means of the stomach-tube.

If we look back at the numerous methods suggested for the study of motility and find that even to-day there is no uniformity as to the most reliable method, it becomes evident that the exact determination of motility of the stomach, although quite important, is not simple.

In order to obtain a standard period during which the stomach should be completely emptied of macro- and microscopical residue, it is essential to adopt a definite quantity of food, of a certain variety, to be taken a certain number of hours before the meal is removed from the stomach. It is not our intention to discuss the numerous methods devised for that purpose, as most of them are too complicated for clinical purposes, and are no more exact than the ones we deem it essential to describe.

The first that deserves mention, which with some modifications is in use to-day, is the meal advised by Boas and Deutsch<sup>2</sup> to be taken by the patient the night previous to the examination. It consists of

White bread with butter.....	75-100	gram.
Cold meat .....	150	gram.
Tea with milk and sugar		

The next morning the patient comes on an empty stomach; when motility is normal no macroscopical residue should be found, and according to Bamberger,<sup>3</sup> even microscopical residue is pathologic. Strauss<sup>4</sup> modified the method by adding currants to the evening meal, because of the fact that in normal motility the stomach should empty itself even of the seeds within ten or twelve hours. Others substitute rasins or blackberries. Whichever of these substances is given, Strauss rightfully cautions against their use in cases where an active ulcer of the stomach is suspected, because the seeds may serve as an irritant to the eroded surface. Safer is the method advised by Robin and Grandauer,<sup>5</sup> who give 2 gram. of bismuth with the evening meal and examine for bismuth crystals the next morning. Bourget<sup>6</sup> adds six cooked prunes to the evening meal and examines the following morning for the prune shells.

In private and in hospital practice where we can have our orders carried out precisely, the above-mentioned night meal suffices, and ten or twelve hours after the meal the stomach is emptied by means of the stomach-tube. In dispensary practice the time of the meal must be suited both to clinician and patient. A meal must be given by which the stomach will empty itself in less than ten or twelve hours. The original Leube-Riegel meal normally leaves the stomach in seven hours. This consists of

A plate of meat soup.....	400	c.cm.
Beefsteak . . . . .	150-200	gram.
Mashed potatoes . . . . .	150	gram.

Owing to the fact that this is only an approximate estimate of the motility of the stomach, as there may be pathological disturbances and the organ still empty itself of such a meal within seven



hours, Bourget and Faber modified this method by having the patient eat a more voluminous meal. It consists of 250 c.cm. barley soup, 2 slices of bread, 50 grm. chopped meat, 8 prunes. This method was put to the test in many clinics, notably the Virchow clinic in the division of Kuttner, by Lindemann. It was even employed for determining the degree of motility disturbance of the stomach.

The procedure is as follows: Seven hours after the Bourget-Faber meal, the stomach-tube is introduced; as much as possible of the contents is obtained by expression, the rest by lavage, using 250 c.cm. of water, most of which is re-obtained into a graduated glass. The lavage is then repeated twice with 250 c.cm. of water, the results being received in separate graduated glasses. We, therefore, have four portions of obtained stomach contents. Each is allowed to stand from one-quarter to one-half hour, and the relation of the solids to the liquids is compared. If examination shows that not one of the four glasses contains any of the food taken with the last meal, motility is considered absolutely normal. If the first glass contains no macroscopical residue, and the second glass contains a slight microscopical residue, but the third and fourth are absolutely clear, the motility is considered doubtful and another examination is made, the meal in that case to be extracted eight or nine hours after ingestion. If there is a residue in the first glass, motility disturbance of the first degree is diagnosed. If there is some in the first glass after expression, and the second and third glass contain considerable macroscopical residue, disturbed motility of the second degree exists. If the first glass shows a considerable quantity of food, and the other three as well, then motility disturbance of the third degree is present.

This method sounds complicated, but is in reality easily carried out, and leads to a very exact conclusion as to the existence of slight deviations from the normal motility of the stomach.

The Bourget-Faber meal is desirable even in dispensary work, provided the clinic is held at a time that will enable the patient to have had a meal seven hours before. If the tube is to be employed at 2 p. m., the patient eats his meal at 7 a. m. If, however, the meal is to be removed at noon he should take, six hours previous, the following:—

- 2 soft boiled eggs
- 2 rolls with butter
- 1-2 cups of buttermilk

We know from x-ray studies that a stomach of normal motility should not show any residue six hours after such a meal is taken. The meal is extracted six hours after—first by the expression method, and then by lavage with 250 c.cm. of water, proceeding

exactly as with the Bourget-Faber meal. This method has the advantage that the stomach is completely emptied. Should there be doubt as to whether all the contents have been obtained, Sahli's<sup>7</sup> method may be employed. He has the patient bend his left side over the edge of the bed in such a way that the head is almost at an acute angle to the lower part of the body. This elevates the pyloric part of the stomach and so facilitates the flowing of the entire stomach contents into the tube.

Other methods advocated to determine the motility of the stomach include coloring substances added to the water, which is removed from the stomach one-half to three-quarters of an hour after being taken; the quantity obtained is measured and for greater exactness the dilution is determined by the shade of the color. Sahli recommends the use of methylene-blue as a coloring agent, aspirating at intervals, beginning half an hour after intake, and noting how long the fluid returns colored. A similar method was advocated by Boas<sup>8</sup> in the use of 400 c.cm. of water to which 20 drops of a saturated aqueous solution of chlorophyll is added. He aspirates thirty minutes later. From a normal stomach not more than 50 c.cm. should be obtained; depending upon the degree of motility disturbance present, 100 or the entire 400 c.cm. may be returned. Kaemmerling<sup>9</sup> tested out this method most carefully and found it had no advantage over the above. In fact he found it less reliable.

The diagnostic value of these last named methods lies in determining whether an obstruction is entirely organic or aggravated by spasm of the pylorus. In cases of complete organic obstruction there is a marked delay even in the expulsion of fluids from the stomach, while in spasm most of the fluid leaves the stomach.

Sahli advises the use of a soup test-meal made as follows: Flour 25 grm., butter 15 grm. Heat both in a pan until brown, add 350 c.cm. of water, and cook. This soup is taken by the patient and removed one hour later, when the fat contents are determined by means of the Gerber-lacto-butyrometer. This method is based on the principle that the soup is thoroughly emulsified and the fat completely mixed; and since the quantity of fat introduced is known, we can judge, by what is obtained after an hour, exactly how much has left the stomach. Although great exactness is claimed for this method by the author, the physiological studies of Prym, Gruetzner and Sick conclusively demonstrate that even in such emulsified soup the fat floats in the stomach, so that while the greater part of the fluid may have left the stomach, most of the fat may still remain.

If for some reason it is not possible to have such a detailed examination made, in order to determine the motility of the stomach, the ordinary Ewald-Boas test breakfast may be resorted to. This method serves a double purpose: determining secretory function of the stomach, plus the rapidity with which the stomach empties

itself. Normally, after the test breakfast, consisting of 250 c.cm. of water or weak tea and 50 grm. of water-roll, we obtain from the stomach in three-quarters to one hour after ingestion about 60 to 80 c.cm. of contents by expression, with an equal distribution of solids and fluids. Two hours after the test breakfast the stomach ought to be almost empty.

In cases of hypermotility with low or anacidity, at the end of an hour there should hardly be any contents. In cases of hypermotility with normal secretion, the quantity obtained after one hour is usually less than normal (about 20 to 30 c.cm.) with an equal distribution of the solids and fluids, and after two hours the stomach is absolutely empty. Where there is hypermotility with increased secretion (duodenal ulcer) it is characteristic that the contents obtained at the end of an hour are less than normal, only about 20 to 30 c.cm., almost all of which consists of fluids.

Rehfuss<sup>10</sup> and his co-workers, in order to empty the stomach completely, advised the use of a weighted stomach-tube, based on the principle of the 'Gross duodenal tube,' except that the former has larger end openings in order to prevent clogging. This tube is furthermore retained in the stomach with less discomfort than the ordinary stomach-tube, until all the contents are obtained by aspiration.

We advocate the following procedure: First introduce the stomach-tube on an empty stomach, as is always done in routine examination. Normally only 10 to 20 c.cm. are obtained as the result of the secretory glands stimulated by the stomach tube and by the saliva swallowed. Such a secretion is either neutral or but slightly acid in reaction. If we obtain more than 10 to 20 c.cm., the question of regurgitated intestinal juices must be excluded by the color and reaction (greenish, weakly acid, neutral or alkaline). In case a quantity of secretion is obtained within normal limits, and it is acid, we determine the degree of acidity. The patient now receives the Boas-Ewald test breakfast which is removed one hour later and acidity determined. After two or two and a half hours the stomach contents are again obtained and the acidity determined. In cases of normal motility the secretion obtained at this time will correspond in acidity to that of the secretion obtained on an empty stomach. In delayed motility, the acidity and the secretion are much higher at this time, proving that the stomach still contains food and necessitating the process of digestion. In cases of achylia gastrica this method would not answer, but could be easily dispensed with, because whenever there is an achylia, the emptying is rapid on account of the open pylorus. If, on the other hand, there is stagnation with achylia, there is usually a high degree of organic obstruction. This is based upon the experimental work of Pawlow, Babkin, Bickel and others, who demonstrated that secretion and



acidity normally are at a minimum, almost negligible on an empty stomach, and begin five to eight minutes after food is taken, gradually increasing, reaching its maximum at the height of digestion, then diminishing to nothing again when the stomach is absolutely empty.

*Examination for Motility of the Stomach Without the Use of a Tube.*—In a certain number of cases where the use of a stomach-tube is contraindicated, we are compelled to resort to other means of examining the secretion and motility. A number of methods have been advocated, none of which has given uniform results in the hands of different observers. All of them differ from the standpoint of exactness, and at best they are methods of necessity, not of choice.

To determine motility of the stomach, Ewald and Sievers advise giving 0.5 gm. salol after a meal, on the theory that the salol is not broken up in the stomach, but in the small intestines, into its components, phenol and salicylic acid. The salicylic acid can then be demonstrated in the urine by its turning violet on the addition of iron chloride. The authors state that in normal motility salicylic acid should be demonstrated in the urine after an hour or an hour and a quarter.

Huber modified this method in that he judged the motility of the stomach by the time between the first and last reactions. Normally, the reaction should be positive up to thirty hours.

Sahli wisely advises that the salol be given in powdered form with water while eating, so as to be thoroughly mixed with the food. Marked delay in the appearance of the reaction, providing the kidney function is not at fault, speaks for motility disturbance of the stomach.

*Examination of Motility by Means of the X-Ray.*—No matter how exactly the above-described methods are carried out, about minor disturbances of the motility of the stomach only an *x-ray* examination can inform us. This method visualizes the contour of the normal stomach and its changes when motility is disturbed. In order to appreciate the value of the *x-ray* as an aid in the diagnosis of these disturbances, it will be necessary for us to review briefly the physiological studies of the stomach with reference to motility. Cannon<sup>11</sup> studied this function in animals by supplying food mixed with bismuth subnitrate, and observing both the way in which the stomach fills itself, and its active propulsion. The human stomach was very carefully observed by Rieder, Kästel, and Rosenthal, and especially by Grödel, both for mode of filling and propulsion. The latter was studied by Cole, George and others by means of serial radiography.

Based on the observations of the above-named authors and our own roentgenological studies, the mode of normal motility can be

pictured as follows. The stomach in an empty state represents a narrow sausage-shaped tube, with lesser and greater curvature separated from each other. This was conclusively proved by the ingenious experiment of Grædel<sup>12</sup> who fastened silver pearls along both curvatures of the stomach of a dog in order to make the outlines of the stomach visible to the *x-ray*. At the top of this narrow tube, just under the diaphragm, air is seen, which is to-day definitely known to belong to the fundus of the stomach and termed 'air-bag' or *magenblase*. When food is taken, the filling of the normal stomach occurs in the following manner. The first morsel reaching the fundus stops just below the air-bag (Fig. 1a) for an appreciable time—3-5 seconds. It then slides downward form-

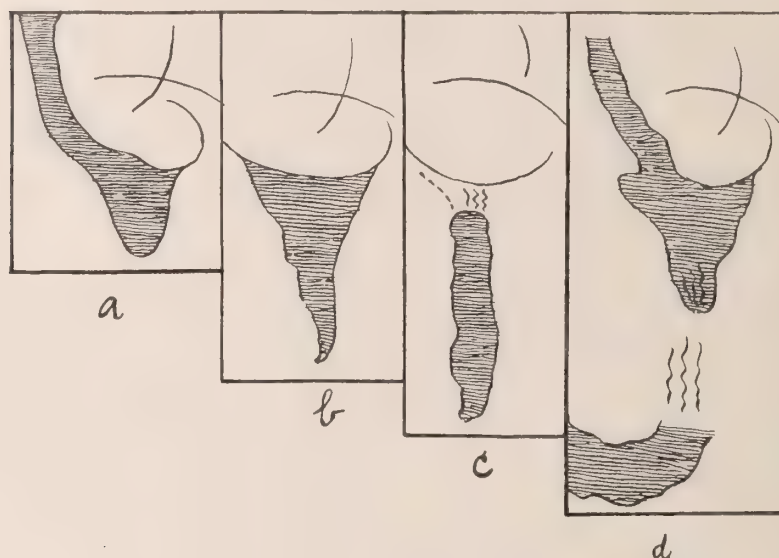


Fig. 1.

ing a triangle with its base upward (Fig. 1b). Then it is seen in an elongated sausage-shaped form (Fig. 1c), finally reaching the caudal point (Fig. 1d). This entire procedure occurs along the lesser curvature in the groove of Retzius, termed '*magenstrasse*' (road of the stomach). The successive morsels follow the same road until about five tablespoonfuls are taken, when the stomach is seen filled in its entire form from the fundus to the pylorus. The rest of the meal taken up to 400 or 500 grm. distends the stomach in width but not in length.

The filling of the stomach is not a passive act of the organ but an active one, *i. e.*, it does so by its tonicity, contracting around its contents. This function was termed by Stiller peristole of the stomach. The filling occurs in strata (*Schichtung*), for the morsels are pushed down onto each other in a wedge-shaped manner. The

first ones, as mentioned above, passing along the lesser curvature, reach the caudal pole and are then driven by the antrum along the greater curvature. By this procedure the first bites undergo acid digestion, while the succeeding morsels in the centre of the stomach are still subjected to the influence of ptyalin digestion. Fluid taken with a meal is largely subjected to the strata formation; a part of it, however, leaves the stomach directly by way of the lesser curvature. In the fundus there is no peristalsis seen; it may be compared to the sinus of the heart. The organ is seen without any visible peristalsis after ingestion of food, for from five to ten

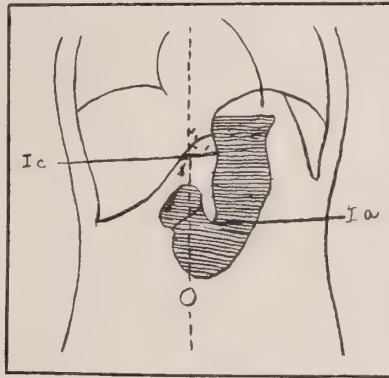


Fig. 2.—Ic, incisura cardiaca; Ia incisura angularis.



Fig. 3.

minutes. During this stage secretions are still alkaline throughout, and starch digestion can be continued.

After five or ten minutes, corresponding to the beginning of secretion, peristalsis is seen. It begins at a point just opposite the incisura cardiaca (Fig. 2), running along the greater curvature, forming shallow waves. At a point opposite the incisura angularis the wave deepens. Very small waves are also seen along the lesser curvature. That part of the stomach, beginning at the incisura cardiaca and terminating at the incisura angularis, is the corpus ventriculi (Holzknecht) or saccus digestorius (Forssel). At the incisura angularis the waves get deeper first at the lesser curvature (Fig. 3a), meeting with a similar constriction at the greater curva-



ture, sphincter antrii pylorici (Fig. 3b), finally separating the distal part of the stomach, antrum pylorii, from the proximal part of the stomach—corpus ventriculi (Fig. 3c). In the antrum (pars pylorica saccus digestorius, Forssel), the waves are deeper than in the corpus, running from sphincter antrii pylorii to the pyloric sphincter. The shallow waves at the corpus are seen approximately every six to ten seconds, while at the pylorus the waves are seen at longer intervals—twenty to thirty seconds.

The existence of an antrum is to-day a disputed question between anatomist and radiologist. We, in accord with Grædel, Hertz and Holzknacht, as well as the anatomist Werenstedt, hold that the existence of an antrum cannot be denied. The object of the peristaltic waves of the corpus is to propel the food into the antrum, that of the antrum to propel the food into the duodenum during which time the sphincter pylorii is almost completely closed, as seen by the separation of corpus from antrum. Part of the food goes back into the corpus as the sphincter antrii begins to open again. The propulsive action of the corpus may be compared to the auricle of the heart, the sphincter represents the autico-ventricular valve; the propulsive action of the antrum pylorii may be compared to the ventricle of the heart. According to Cannon and Grædel, the deep antrum waves have also to do with mixing the food. While this is possible, it seems more likely that the mixing of the contents is carried on by the finer action of the muscularis mucosa. The minute waves running over the walls of the stomach, observed in animals and also mentioned by Grædel, must be attributed to the mixing action of the muscularis mucosa. Antiperistalsis was observed by Cannon in the antrum while the sphincter pylorii is closed. By means of antiperistalsis, solid particles not fit to pass the sphincter are driven back toward the corpus. Just as the filling of the stomach is accomplished in continuous strata, *i. e.*, each successive morsel aiding in advancing its predecessor toward the pylorus, so is this the case with the propulsion of the material digested.

By what influence are the above described peristaltic waves brought about? Primarily, by the food in the stomach causing secretions. These secretions in the fundus and corpus reach the superficial layer of the food, causing peristaltic waves and thereby moving the chyme to the antrum. Here the stronger acid secretion causes the deeper waves in the antrum, propelling the food in the direction of the sphincter pylorii which opens only when the food is fit to pass into the duodenum. This does not occur after each wave but after a few successive waves. The opening of the pylorus is accomplished (according to Cannon) by the acid of the stomach allowing the food to pass into the duodenum. In the duodenum the acid reflex (Hirsch and Mering, Pawlow, chemo-reflex) causes a closing of the sphincter pylorii at the same time stimulating the

alkaline secretion in order to neutralize its contents, at which stage the pylorus opens again.

Other influences on the motility of the stomach as well as the opening of the sphincter pylorii are (a) the quality of food taken; (b) substances that tend to neutralize or increase acidity. Solid food of a coarse nature increases peristalsis of the stomach; it requires many waves before the sphincter opens. If oil or other fat is given because of diminished acidity, it diminishes peristalsis. If acid is added to the food, peristalsis is increased, but on account of complete closure of the sphincter pylorii the emptying is delayed.

Certain substances that need no digestion in the stomach, and isotonic solutions, pass along the groove of Retzius (*magenstrasse*) without mixing with the contents of the stomach, by way of the antrum into the duodenum. Temperature of the food taken influences peristalsis. Very cold substances increase peristalsis; hot substances diminish it. The most appropriate food, therefore, is of body temperature (98°).

The extra-gastric influences on peristalsis and motility are mechanical, by means of external manipulation; thus we can see fluoroscopically in the bismuth-filled stomach that pressure from without causes increased peristalsis in corpus and antrum. Walking, breathing, as well as all forms of exercise stimulate peristalsis in the stomach.

From the jejunum, ileum, appendix and colon when filled, a reflex action is exercised on the peristalsis of the stomach mostly of an inhibitory nature. The experimental work of Cohnheim and others demonstrated that acidity lower down in the small intestine has an inhibitory effect on the peristalsis of the stomach, and alkalinity an augmentary influence. Kreutzfuchs and Glæssner proved this roentgenologically, showing that hyperacid duodenal contents cause reflexly, besides spasm of the pyloric sphincter, marked diminution in peristalsis of the stomach. An over-distended intestinal tract has a stimulating effect on peristalsis of the stomach.

Besides these influences, the integrity of the nerves controlling the stomach is of paramount importance. The experimental work on animals in anesthetizing same and still causing the small movements of the stomach, as well as the fact that an excised stomach, when put into a normal saline solution may continue to contract for many hours, demonstrated that the intrinsic nerves in the stomach have an influence on the small contractions of the organ.

The stimulating influence of the vagus on the stomach is demonstrated experimentally by cutting both vagi at a point where their branches are given off to the lungs and heart when the stomach is full. A great deal of food will remain undigested under such circumstances. Stimulation of the peripheral end of the vagus stimulates the stomach wall as well as the sphincter. If atropine is ad-

ministered before the peripheral end of the vagus is stimulated, there is no response on the part of the stomach (paralysis of the vagus by atropine). The motor effect of the vagus on the fundus is to increase its tone; on the pylorus to increase peristalsis. The sympathetic influence on the stomach consists in diminishing the motor action of the stomach.

The motility disturbances, as determined by subjective and objective findings, are undoubtedly most leading; through the *x*-ray we can, by the way the stomach fills itself, as well as the position of the organ and mode of peristalsis, judge defects in tonicity and motility at an earlier stage. When a stomach fills in the manner described above, and appears as shown in the accompanying fig-

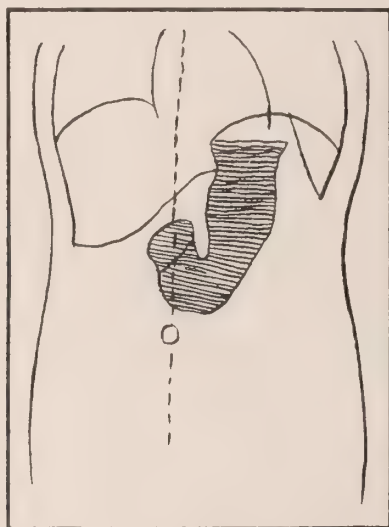


Fig. 4.—Orthotonic stomach.

ure (Fig. 4), we speak of an orthotonic stomach (Holzknecht). If we observe fluoroscopically that the food morsel instead of stopping under the air-bag falls to the caudal point, filling up the corpus of the stomach and only part of the fundus, while the rest of the fundus represents either an elongated air-bag alone, or the air-bag plus a thin layer of secretion, we speak of a hypotonic stomach (Fig. 5). It consists pathologically of a disturbance of the organ by which it fails to accommodate itself to its contents (disturbed peristole). Holzknecht, who first used the term hypotonic, asserts that there is likewise a delay in emptying the organ. The emptying of such a stomach on time depends upon the underlying cause. Affections of extra-gastric origin (status asthenicus, appendicitis, ileac stasis, etc.), if not accompanied by secretory or structural changes of the stomach proper, cause no delay in emptying. If, on the other hand, the cause of hypotony lies in increased secretion in the stomach,



with or without structural changes in the mucosa or musculature, a delay in emptying is the rule.

Hypotony resulting from a functional or organic disturbance of the nervous system may be the cause of a delay in the emptying of the stomach, first, because of loss of the vagus' influence on motility itself, and second, by the increased secretions present in such cases.

Where, besides the peristole disturbance in the fundus there is also a defect in the tonicity of the musculature of the corpus, we speak of atony. Depending on the state of the disturbance of the musculature of the stomach, Boas speaks of three degrees of atony:



Fig. 5.—Hypotonic stomach.

- (1) when there is a delay in emptying of from two to four hours;
- (2) of from four to eight hours; and (3) beyond twelve hours.

By means of the *x-ray* we are in a position to differentiate the different degrees of atony, not only by the time of emptying, but also by the mode in which the stomach fills itself. In atony of the first degree the food is seen to drop down to the caudal point, just as in hypotony; the successive morsels distend the corpus so that not only the pylorus but a part of the corpus is toward the right of the median line (Fig. 6). The organ is also enlarged from above downward. Peristalsis in such a stomach sets in later than normal (fifteen to twenty minutes), but may be of normal or even excessive depth. Peristalsis is very weak in atony of an extra-gastric nature (status asthenicus, anemia, etc.). It is increased where the atony is the outcome of a hindrance at the exit of the stomach.

The second degree of atony differs but little in the mode of filling and appearance from the first degree, but peristalsis is very shallow or very markedly delayed. Such atony is in the great majority of cases due to a higher degree of obstruction. Finally, in atony of the third degree the food fills the stomach in a half-moon shape; the fundus and antrum are not seen at all, and peristalsis is absent. Here we have to deal with complete obstruction of the pylorus (Fig. 7).

The two phenomena, stiffening of the stomach and antiperistalsis, both the outcome of complete pyloric stenosis, have been observed



Fig. 6.—Atony of the stomach.



Fig. 7.—Atony of 3rd degree.

fluoroscopically. The former is represented by a large, over-distended sheep's bladder-like stomach filled from fundus to antrum. The latter, as first observed by Jonas, shows peristaltic waves running in opposite directions.

That form of disturbed motility manifesting itself by increased peristalsis and quick emptying was made accessible to diagnosis mainly by means of the *x-ray*.

Hyperperistalsis and hypermotility are not synonymous. By hyperperistalsis we understand increased peristaltic contractions in corpus and antrum, both as to depth and time of occurrence. By hypermotility is meant a condition in which the stomach empties itself more rapidly than normal. Hyperperistalsis is only associated with hypermotility (quick emptying) when there is no obstruction at the pylorus and no hypersecretion. Even physiologically, in the bull-horn stomach described by Holzknecht (Fig. 8), which is

usually situated higher in the abdomen than the syphon-form stomach, the emptying is more rapid although peristalsis is perfectly normal. In hypoacidity and achylia gastrica where secretion is diminished or absent, hence the open pylorus, emptying is very quick although there are diminished peristaltic waves.

Pathologically, hyperperistalsis may be of mechanical, chemical, or neuropathic origin. The mechanical etiology has already been mentioned—where there is a hindrance at the pylorus and the compensation of corpus antrum is thoroughly established. Chemically, hyperperistalsis is due to hyperacidity and hypersecretion, and is exemplified by ulcer ad- or post-pyloricum. In the former it is associated with pylorospasm (closed pylorus); in the latter it is seen with a partially or completely open pylorus. In hyperperistalsis that is seen at times with pylorospasm there is no hypermotility; in fact, there is often a delay not only in the stomach but throughout the entire intestines. With the hyperperistalsis seen in duodenal ulcer, there is generally a hypermotility throughout the stomach and

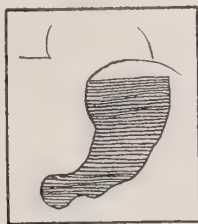


Fig. 8.—Bull-horn stomach (Holzknecht).

bowels. Hyperperistalsis of neuropathic origin is seen in lead poisoning, in excessive users of nicotine, sometimes with tabes dorsalis, and in those who have tendencies to spasticity. In the great majority of cases of hyperperistalsis of neuropathic origin there is a hypermotility in the stomach only, while in the colon there is often a delay in the furthering of its contents. The hyperperistalsis in the stomach has a tendency to further its contents, while hyperperistalsis in the colon closes tightly on the contents (spastic contractions).

Hyperperistalsis of extra-gastric origin we see in cases of cholelithiasis, kidney-colic, chronic appendicitis and intestinal stasis. This is mostly associated with normal motility, rarely hypomotility confined to the stomach only. Hypermotility without hyperperistalsis is in the great majority of cases of purely chemical origin. If secretion and acidity are considerably diminished (hypoacidity) or entirely absent (achylia), the acid reflex on the sphincter pylorii is absent; hence the open pylorus allowing the contents to pass through. For the rapid emptying here two factors are responsible—the visible open pylorus, and the absence of acid reflex from the lower part of the intestine, causing excessive action of the motility of the stom-



ach (Best and Cohnheim). In the achylia form of hypermotility the increased evacuation is also present in the small intestine as well as in the colon, hence the diarrhea.

Holzkecht and Fujinan<sup>13</sup> suggested the following procedure in determining whether delay in emptying is due to muscular weakness of the stomach or a stenosis at the pylorus: After giving the patient 500 c.cm. of water and a capsule filled with 1 gm. bismuth subnitrate, the time the water and bismuth leave the stomach are noted. If delay in motility is also present when the water is given, an organic stenosis at the pylorus is present. Normally, it leaves the stomach within fifty to sixty minutes.

To differentiate between stagnation due to pylorospasm or organic stenosis, Holzkecht and Sgalitzer advise the use of papaverine or atropapaverine 0.05 gm. one hour after the meal. If due to spasm this drug causes relaxation of the pylorus and the stomach empties itself.

*Etiology.*—Disturbances in motility may be due to affections of the other functions of the stomach (secretory), a very frequent cause; or structural changes (ulcers and malignant or specific diseases); or weakening of the musculature, often a part of status asthenicus. It is frequently associated with wasting diseases and excessive eating or drinking.

A most frequent intra-gastric factor is a hindrance, complete or incomplete, at the exit of the stomach.

Disturbed motility of extra-gastric origin results from a great variety of causes, such as pressure on the stomach from without (for example, tight corseting), enlarged adjoining organs, or continuous prolonged pressure from an over-distended descending colon and splenic flexure, ptosis of the stomach with the pylorus high, duodenal kinking, adhesions at the pylorus or other parts of the stomach; finally, cholelithiasis, chronic appendicitis, renal colic and affections of the pelvic organs.

*Subjective Complaints.*—We have dwelt rather exhaustively on objective findings because the subjective symptoms are not very characteristic. A careful analysis of complaints, however, may lead to a reasonable determination as to whether hypertonicity with or without hypermotility or hypotony exists. Atony, especially that of a higher degree, has characteristic symptoms.

It is self-evident that in determining the underlying causes of these conditions the methods described above are the only ones of importance. The symptoms of hypertonicity associated so frequently with duodenal ulcer, pyloric adhesions and cholelithiasis, cannot be considered here, as the symptoms of the underlying disease practically mask the significance of the hypermotility. On the other hand, where the tone of the stomach is increased on account of nervous affections either of a functional nature (neurasthenia

hysteria), or organic nervous affections on account of chronic metallic poisoning (lead), tabes dorsalis, or by toxic agents (nicotine), the patient has definite symptoms. Immediately after a meal there is a sensation of discomfort in the form of unrest in the region of the left hypochondrium, due to the fact that the stomach contracts so forcibly that the air and some unchanged food are forced against the cardia, causing distress which is only relieved upon belching. When the stomach is full, the food is up and against the cardia, causing regurgitation. Such regurgitated food is tasteless and odorless. If hypermotility accompanies the condition, frequent hunger is experienced; this may be due first to the fact that the patient takes small meals on account of his discomfort during eating, and secondly, because the stomach empties sooner. In some cases this hypermotility seems also to exist in the small intestine and gives rise to hyperactivity, causing the patient a sensation of intestinal unrest, nausea and a desire to go to stool after a meal.

In the hypotonic stomach during the early stages, complaints are chiefly at the time the meals are taken, provided there are no secretory disturbances of the stomach. The patient has a feeling of fulness and distention immediately after meals, and external pressure (corsets, belts, or even trousers) causes discomfort.

In cases of atony, symptoms depend on the degree of stagnation as well as on the underlying cause. As minor degrees of stagnation are mostly due to pylorospasm added to an organic disease of the pylorus, usually of a benign nature (ulcus ad pyloricum), the symptoms of that disease are present. If such atony is due primarily to weakness of the stomach musculature, the symptoms of general asthenia are present, plus a fulness all the way down to the umbilicus, persisting for hours after a meal, or it may be present all the time. These people complain that they are never hungry, probably due to the fact that the stomach has no contractile power. In higher degrees of atony, where there is a residue in the stomach ten or twelve hours after a meal, in addition to the above symptoms, patients are frequently only relieved by vomiting. The most distressing symptoms, of a fairly characteristic nature, exist where there is atony as a result of complete obstruction. Here the stomach musculature has completely lost its contractile power and it is in a state of paralysis. Complaints are of a general and local nature, with general weakness from lack of food, thirst and diminution of urine. The gastric symptoms are continuous distress in the abdomen, belching, eructation of a disagreeable odor and an unpleasant taste, frequently fetor ex ore. Vomiting is rare (on account of paralysis of musculature); if present it is in small quantities and consists of food taken by the patient days before. In such cases the symptom-complex, known as tetany of gastric origin, occurs in the final stages of the disease.

*Treatment.*—It is obvious from the description of the symptomatology that treatment must be directed toward the underlying cause. In hypertonicity from duodenal ulcer, gall-stones, appendicitis, etc., the cause must be removed. The hypertonicity associated with the functional nervous diseases can only be overcome by treatment of the nervous system as a whole. For local gastric conditions, we order the patient to eat slowly, chew well, and have food neither too hot nor too cold, the mode of eating being more important than the kind of food. Much benefit is often derived from sipping, with meals, warm tea, warm milk, or warm milk mixed with sweet cream. The application of Priessnitz compresses after the chief meal, as well as a Priessnitz compress at night is often very beneficial. If all this is not sufficient, antispasmodics in the form of extractum belladonna 0.03 grm. per rectum or, if painful sensations are also present, papaverine 0.04 to 0.05 grm., alone or combined with atropine, may be given once or twice daily, either in the form of a suppository or by mouth. In cases where constipation is present or the symptoms point to hyperesthesia of the stomach, olive oil or Russian mineral oil, or liquid albolene may be used in tablespoonful doses before meals. With hypertonicity as a result of nicotine, lead, or organic nervous diseases, especially tabes dorsalis, it may be essential, besides the removal of the cause, to treat the gastric symptoms as outlined above.

In our therapeutic efforts in cases of hypotony as well as atony, care and judgment should be exercised in order to accomplish results at a time when repair is still possible. Minor degrees of hypotony of a purely functional nature, due to weakened musculature, or secondary to some intra-abdominal disease, may often lead to organic changes within the stomach proper (ulcus ventriculi) if the condition is not corrected. When secondary factors play a part, such as appendicitis, cholelithiasis, adhesions of the stomach or intestine or intestinal stasis, they must be removed. Where the hypotony or atony is the result of a disease of the stomach proper, either catarrh, ulcer, benign incomplete obstruction at the pylorus, or muscular weakness of the stomach, inborn or acquired (overeating, pendulous abdomen), the disturbed motility must be treated as if it were an independent disease.

It is a well-known clinical fact that patients with ulcer of the stomach, having responded to internal treatment and being discharged, immediately have a recurrence of gastric discomfort; this time the symptoms are not of a secretory (hyperacidity) and motor disturbance, but present a picture characteristic of hypotony. Without treatment the ulcer symptoms return very quickly, serious complications may arise, hypotony advances to a stage of atony, and control of the disease is completely lost.

It is our belief, as pointed out in our article on *Ulcus Ventriculi*



(*Arch. Int. Med.*, March, 1914), that hypotonic conditions aggravated by frequent disturbances of secretions (hyperacidity) are an important factor in the etiology of gastric ulcer and practically the pre-ulcerative stage.

Treatment should be based on the principle that in minor disturbances of motility we should so guard the organ against dietetic insults (sparing diet) that the disease may not progress, and complete recovery may eventually take place. Where this is impossible, efforts should be made, through the treatment outlined below, to have the patient wholly comfortable and unaware of any disturbance.

The principles of treatment are:—

1. Rest for both body and mind.
2. Diet.
3. Physical treatment.
4. Medicinal treatment.

In milder cases a rest of from a half to an hour after the chief meal, with the patient lying on his right side or back, gives considerable relief. It enhances the emptying of the stomach considerably and even light slumber in the course of that short time favorably influences the system at large, of which the stomach is but a part. Should even minor degrees of motility disturbance be the result of a marked general ptosis (Glénard's disease) or acquired ptosis (excessive loss of weight), more rigid rest for body and mind becomes imperative. In such cases a rest cure or the modified Weir Mitchell treatment should be used. By this we mean a modification both of the degree of rest and the diet originally prescribed by Weir Mitchell, *i. e.*, an exclusive milk diet for the duration of the rest cure. In many cases it is strongly advisable to remove such patients from their daily surroundings and responsibilities for two to four weeks annually, depending on their circumstances. For many patients such treatment is trying both to the nervous and digestive organs. It is therefore well to prescribe a specified schedule for the day, including rest, diet, exercise, physical treatment, and, if necessary, medicinal treatment.

*Diet Regime.*—On awakening the patient should be given weak coffee, cocoa, chocolate or tea with three-quarters milk in turn to please his taste; also four to six pieces of zwieback with butter. A half hour later hydrotherapeutic measures (sponge baths or pine needle baths, mild showers, Sitz-baths of 90°, or cool packs, and in circulatory disturbances carbonic acid or oxygen baths) should be applied. Then the patient rests until 10 a. m., when he is allowed to dress comfortably and have his breakfast, preferably with company at the table. This meal consists of two eggs in any form, except hard boiled; toast and butter, progressing from the toast to

white bread one day old and finally graham bread or whole wheat as the condition improves and permits; in addition a cereal well cooked in milk and butter, but thickly prepared. After this the patient is allowed to rest in a chair—in good weather in the open air—or even to walk for ten to fifteen minutes. He then goes to bed, and in case of any discomfort in the epigastrium a Priessnitz compress is applied to the abdomen. Where possible, it is, of course, very advantageous to rest in the open air, protected against the wind. At 12:30 dinner is served at the table, consisting of finely chopped meat broiled or fried in butter, and as the condition improves meats must not be served chopped. Once a week fish may be substituted. In the beginning of the treatment (first and second weeks) the vegetables should be served in purée form and should be the carriers of fat in the form of either cream, butter or olive oil. The vegetables should be of a sort not to bloat the stomach; and spinach, string beans, carrots, asparagus tips and green peas are allowed. Cooked fruits without seeds and some light cereal pudding are also included. With the dinner a mild alkaline water (150 c.cm.) mixed either with light wine (30 gm.) or some fruit syrup is permissible. After this, complete rest, if possible in the open air, chiefly on the right side, with a Priessnitz compress. At 3:30 p. m. the patient is allowed to walk or sit in the open air and receive visitors until 4 or 4:30, at which time a meal similar to the one of early morning is to be given. The patient should then rest in an easy chair, alternating with short walks of ten to fifteen minutes until 6:30 p. m., depending on physical condition.

Supper is then served, consisting of eggs, boiled ham or veal served cold, or fish, salad finely chopped, fresh cream cheese and toast, white bread or graham bread served with butter. After this the patient remains in bed until the next morning, reading or receiving visitors only until 9 or 10 p. m., when either a cup of warm milk or a glass of alkaline water or, in case of restlessness, an infusion of valerian is very efficacious. This is made as follows: Put one tablespoonful of valerian leaves into 8 oz. boiling water and let stand for eight to ten hours. In the evening it is strained and served cold with sugar before retiring, and a Priessnitz is applied around the abdomen. As a suggestive measure it may be necessary to use mild forms of electricity, general or local, and mild, general or abdominal massage. If such treatment is carried out in mild cases a considerable gain in weight results, and general as well as local improvement, and where repair is possible even a complete cure may be achieved. Naturally, such treatment requires a skilled cook and favorable surroundings, well conducted sanatoria being ideal places for such a purpose.

Where such rigid measures are not necessary we proceed as follows: In the morning at 6:30 or 7 o'clock mild forms of hydro-

therapeutic treatment, mentioned above, are carried out. Then a substantial but easily digestible breakfast is served: two eggs in any form except hard boiled, weak coffee or weak tea with cream, or chocolate, cereals with cream or, for a change, either lamb chops or boiled ham, or toast well buttered. After this the patient should recline for a half hour and then be allowed to go to business. His luncheon, between twelve and one o'clock, should consist of fish, cereal, or eggs, a baked apple with cream, vegetables like spinach, etc., cream cheese and toast or rolls well buttered. The length of time including rest should occupy from one to one and a half hours. Dinner at 6 or 6:30 should consist of meat, chopped in the beginning of the treatment and later in any other form, vegetable purée, stewed fruits, cereal pudding, and some alkaline drink, with or without a mild wine. He should rest on his right side for fully an hour, after which pleasant social intercourse until 10 or 10:30 p. m. is permitted, when he retires with a Priessnitz compress around his abdomen.

It may be observed that no soups and but little fluids are allowed with the diet, as in these cases fluids tend to distend the stomach. Even if secretory disturbances co-exist, the diet outlined will suffice. Where hyperacidity is present no wine is allowed and more cream, butter or oil is added to the diet. A well-fitting abdominal binder is advantageous.

*Lavage of the Stomach.*—In mild cases there is no indication requiring lavage. In cases where residues are found we must first determine whether they cause great discomfort, and even if so, whether the treatment outlined above will not in itself relieve the condition. Sometimes small residues superadded by pylorospasm cause disturbance, so that our treatment does not influence the patient at all. Here it becomes necessary to wash the stomach in the morning with 250 c.cm. of water mixed with a teaspoonful of sodium bicarbonate, and where catarrhal changes are found (mucus to excess) normal saline solution may be used. Usually four to five days of lavaging in the morning are sufficient. In instances of more marked stagnation (atony), especially when food is found in fair quantities on an empty stomach, lavage becomes an absolute factor in the treatment. A thorough lavaging is necessary until the water returns clear, and we must be certain that all the fluids are returned. This should be done two hours before breakfast, and after five or six days under proper diet the stomach will show a tendency to be clean in the morning. Like Boas, we introduce the tube two hours before breakfast and have the patient express the gastric contents without using any lavage. Sometimes it is wise to use duodenal feeding, as advocated by Einhorn.

*Medicinal Treatment.*—In mild cases very little medication is necessary. If notwithstanding the dietetic treatment complaints are



present pointing to delayed motility, strychnine nitrate 0.001 grm. T. I. D. after meals, or Tr. Nucis Vomicae, 5-10 drops may be given. In cases of anemia a course of sodium cacodylate in ampoules to be used hypodermically in ascending doses can be tried, beginning with 0.05 to 0.1 grm. and then descending, 20 to 30 injections being used, or iron, arsenic and strychnine in pill form. If hyperacidity is present, alkalines like magnesia usta, sodium citrate, sodium bicarbonate, etc., with or without belladonna, may be necessary.

*Surgical Treatment.*—Surgical treatment of delayed motility demands consideration first and foremost, where malignancy is suspected and the case is still an operable one. In cases of adhesions of the pylorus or other parts of the stomach causing continuous complaint which have not yielded to the foregoing treatment, operation may be advisable. In cases of delayed motility of minor degree and such as are due to weakness of the musculature of the stomach and ptosis, we consider surgical interference contraindicated. Notwithstanding the great effort to have diagnoses confirmed by operative interference and thereby widening the field of gastro-intestinal surgery, it is true that the medical practitioner is but too often visited by patients who have recently undergone gastric surgery (gastro-enterostomy, plication, etc.) only to increase the number of their complaints. It cannot be denied that there is a great tendency to turn over the field of gastro-enterology to the surgeon. We decidedly agree with the more conservative clinicians like Boas, Rosenheim, Einhorn, Hemmeter and others, that before advising operation we must be absolutely certain that such is indicated, and above all, that it will really benefit the patient. Even in cases of disturbed motility where there is considerable residue on a fasting condition ten to fourteen hours after a meal, we advise carrying out the treatment as outlined above, and while a complete cure cannot be promised it is certain that if the patient heeds advice he can lead a very comfortable existence and go about his affairs. Should, however, a conscientiously administered internal treatment not prove as effective as we desire, or the patient for some reason be unable to undergo medical treatment, operation is advised. Previous to this it is important to determine exactly the compensatory ability of the stomach, in order to prognose what the effects of the operation would be.

Where marked delay in motility is associated with hyperperistalsis of the pylorus and corpus, two conditions are demonstrated—first, that the stenosis is here aggravated by hypersecretion causing pylorospasm; second, that the musculature is in good condition. Here a posterior gastro-enterostomy would be of great benefit. On the other hand, where the stenosis is accompanied by a high degree of atony of the stomach, the internal treatment should be instituted

in order to bring about the return of tone to the stomach, and then if there is a great tendency to recurrence, operation is advised.

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THE CEREBROSPINAL FLUID IN SYPHILIS OF THE NERVOUS SYSTEM WITH SPECIAL REFERENCE TO LANGE'S COLLOIDAL GOLD REACTION.\*

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The colloidal gold test, or 'goldsol reaction,' was first applied by Carl Lange to the study of certain diseases which show a particular tendency toward involvement of the central nervous system. In the comparatively scant literature which has appeared on this subject, it is quite generally conceded that this test deserves a place of rank among other longer known laboratory methods diagnostic of syphilis of the nervous system. However, there is an apparent difference of opinion as to the value of some of the mild reactions.

The principal of the test rests upon the work of Zsigmondy with proteins and a solution of colloidal gold. He found that a solution of colloidal gold in the presence of an electrolyte, such as sodium chloride, underwent a breaking up and precipitation. Depending upon the degree or extent to which this breaking up occurred, the gold solution showed a varying change in color, ranging from red in the unchanged solution, through purple, blue, etc., to colorless when complete precipitation had occurred. The color may then be used to estimate the degree to which the colloidal gold solution has been broken up. Zsigmondy further found that this breaking up could be inhibited, or entirely prevented, by the presence of protein bodies in the electrolyte-gold solution. This protection, moreover, varied in degree according to the particular protein employed; that is, a given protein seemed to possess a characteristic and specific inhibiting power when the reagents used were of a certain standardized optimum concentration. In other words, it appeared to be possible to recognize and identify a given protein by its action upon the electrolyte-gold solution.

On the basis of this work of Zsigmondy, Lange attempted to identify the several protein bodies which are present in the cerebrospinal fluid both in conditions of health and disease. The test is then but another one for protein, of which already we have many clinically applicable to the cerebrospinal fluid.<sup>1</sup> Whether or not

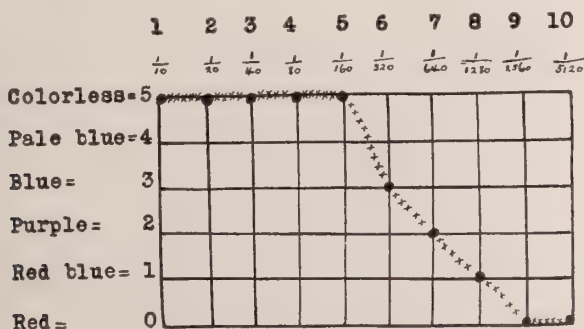
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Lange succeeded in his attempt is not stated in his first papers.<sup>2, 3</sup> Early in his work certain similar reactions were repeatedly noted with the cerebrospinal fluid of individuals with syphilis of the central nervous system. Attention was thus diverted to the study of this special phase of the work. This has led to the test commonly known by Lange's name, or as the colloidal gold or goldsol reaction.

The details of the technique of the test have been made known in several other accessible publications.<sup>4, 5, 6, 7, 8, 9</sup> Therefore, only an outline of the principal features will be repeated in order to make the expression of our results sufficiently clear. As employed by Lange, a series of eleven tubes are used in the test. In the first tube 0.2 c.cm. of cerebrospinal fluid is added to a sufficient quantity (1.8 c.cm.) of a 0.4 per cent. sodium chloride solution to make a one in ten dilution. From this tube subsequent dilutions are made with the salt solution, 1:20, 1:40, 1:80 and so forth up to 1:5120 in the tenth tube. Tube eleven contains no cerebrospinal fluid and serves for a control. The bulk in each tube is the same (1 c.cm.). Now to each tube is added 5 c.cm. of the solution of colloidal gold as rapidly as is consistent with accuracy. The reactions should be read the following day. For clearness in reporting results this series of tubes may be numbered from one to ten, beginning with the one of greatest concentration. Also, a scale of color shades, from the original unchanged 'high red,' through the purples, blues, etc., may for convenience be numbered from 0 to 5. If now the tube dilution numbers are expressed on the abscissa and the color numbers on the ordinate, we may report our results in a graphic form. For instance, take the result so frequently found in the cerebrospinal fluid of paretics—a colorless solution in the first five tubes and a rapid or gradual return to unchanged in the succeeding two or three or more. Such a result may be expressed numerically as follows:—5555532100, or graphically thus:—



A number of workers<sup>10</sup> have adopted the scheme, similar to that used in the Wassermann work—namely, reporting their results as 1X, 2X, 3X, or 4X according to the intensity. It seems, however, more desirable, until we know more certainly just how we

should interpret our findings, to record the reaction as found in each tube.

Regarding the care necessary in performing the lumbar puncture and obtaining the fluid, as well as the performance of the test itself, certain restrictions have been imposed which seem of sufficient importance to permit of mention here. The colloidal gold solution must conform to certain physical requirements as to color and clearness, and unless this is so the test is useless. The difficulty in preparing a proper gold solution has been urged against the test, but such an objection is unimportant. The reagents used must be pure and the solutions prepared with double distilled water. All glassware used must be carefully cleansed. It is particularly necessary that it be free of all traces of alkali. As to the necessity for these precautions, there seems to be little if any doubt in the minds of those who have worked with the test. A special dry sterilization of the puncture needle, as recommended, does not, however, appear necessary. We have sterilized our needles by dry heat in test-tubes and by the usual boiling methods and cannot see that the results have in any way varied according to the method of sterilization employed. A point in our technique may explain this. At all punctures, it has been the custom to draw fluid into two tubes in about equal amounts, from 10 to 15 c.cm. in all. The fluid which is collected in the first tube has served to wash out any water that was not shaken free from the needle after wet sterilization. Thus, also, faint traces of blood may often be avoided in the second tube. We are not of the opinion that a faint trace of blood interferes with the accuracy of the test. At least in our cases, as shown in the tables, no interference from this source could be ascertained. The fluid in the second tube is used for the colloidal gold test. In some cases tests were made with the fluid in both tubes, and sometimes a third, without showing any difference in the reaction. As to the reading of the reaction it is necessary to do this by daylight only, on the day following the setting up of the tests, that is, about twenty-four hours later.

As to the interpretation of the results from the diagnostic standpoint, Lange recognized two main groups of reactions according to the part of the series of tubes—the dilutions—in which they occur. The first, where the maximum intensity of the reaction is reached in tubes three and four, he calls the luetic zone. The second, with its maximum intensity in tubes seven and eight, he speaks of as the non-luetic zone. In the first, or luetic zone, are the reactions for syphilis of the central nervous system, tabes dorsalis and paresis. In the non-luetic zone are the reactions for purulent and tubercular meningitis, brain abscess, a few other non-luetic conditions and the reaction given by blood-serum, or by spinal fluid containing blood or blood-serum. It might be mentioned at this point that with blood-serum alone the reaction does not serve to differentiate syphilitic from other sera.

The reactions in the luetic zone are the ones which especially interest us at this time. Regarding these, though somewhat conservative, Lange is, nevertheless, quite specific in his statements as to their diagnostic value. In a given zone a reaction is further characterized by Lange in reference to its depth or intensity, and according to this criterion attempts have been made to differentiate paresis, tabes dorsalis and cerebrospinal syphilis. Such attempts are based on the claim that the reaction of greatest intensity occurs in paresis, that of least, in cerebrospinal syphilis, while tabetic reactions occupy a middle position between these two. Lange believed that these three syphilitic diseases of the central nervous system might thus be differentiated, and that the goldsol reaction curve for each was characteristic. He maintained that if properly done the gold solution remained absolutely unchanged with normal cerebrospinal fluid and that no reaction was given with the cerebrospinal fluid of syphilitics unless the nervous system itself was involved. He finds his explanation of the high percentage of positive colloidal gold tests which he obtained in the assumption that the central nervous system is often involved by the syphilitic process, not only before there is no clinical, neurological evidence of such involvement, but also, even when the Wassermann, Nonne and cell count are negative. In other words, he considers the colloidal gold test more delicate than any other means yet devised for the detection of the involvement by syphilis of the central nervous system. Under certain conditions, probably dependent upon a reagent not quite properly prepared, Lange admits the occurrence of certain mild or slight reactions, a slight change in color in two or three tubes only, concerning the specific diagnostic value of which he is uncertain.

Regarding the zonal differences in reaction as said to exist by Lange there has been some question. Miller and Levy consider the paretic reaction sufficiently constant and characteristic to speak of a third, or paretic zone. Eicke, however, agrees quite fully that non-luetic meningeal inflammations give practically constant curves which cannot be confused with luetic or metaluetic conditions. Glaser<sup>11</sup> is not certain that the shifting of the reaction curve to the right means other than syphilis, as he once got such a reaction in a case of paresis. On the other hand, Miller and Levy have found a paretic curve in meningitis and brain abscess. Jaeger and Goldstein<sup>12</sup> state that the reaction is of no value other than in metaluetic diseases of the central nervous system.

When we come to consider the different reactions which may occur in the luetic zone, a rather general disagreement with Lange's interpretations is met with. Regarding the most intense grade, that shown in cases of paresis, opinion is more uniform. Most workers agree that there is a fairly constantly observed curve which is characteristic for paresis.<sup>13 14 15</sup> Slight variations from this fully typical curve have been noted, and not infrequent among



these is the observation that the first tube often remains unchanged, the reaction beginning abruptly with full intensity in the second tube. For taboparesis, practically the same opinion holds true, although it is believed that in this disease more exceptions may be met with than is the case in paresis alone. Some workers<sup>16 17</sup> find the same curve in paresis as for cerebrospinal syphilis or tabes dorsalis and do not believe a differentiation between these three conditions can always be made with safety by this test alone. Lee and Hinton believe that the syphilitic and paretic curve may be the same, and speak of the reaction commonly considered as characteristic for paresis, as a strongly syphilitic one. Kafka found his results so contradictory at times that he believes the test of no value unless used with others as checks.<sup>18</sup>

As to the constancy of the occurrence of a positive goldsol reaction in tabes dorsalis and cerebrospinal syphilis, there has been expressed a great deal of doubt. It is rather generally admitted that we do find a reaction in most, though not all, of these cases, but that the curve is characteristic neither for syphilis nor tabes dorsalis, possessing no differentiating value. How very mild or partial reactions are to be interpreted remains to a degree uncertain. Flesch claims that in 50 per cent. of normal (non-luetic) cases, a mild reaction occurs in the first three tubes which cannot be considered as pathological or as indicative of syphilis. Kafka also considers such mild reactions as unimportant and non-specific. Kaplan and McClelland adopt the plan of reporting no reaction as positive unless occurring to a certain depth in three or more tubes. Miller and Levy interpret as a positive syphilitic reaction even the slightest variation in color, *e. g.*, 0012100000. Although Lange expressed the belief that absolutely no change in the goldsol occurred with normal cerebrospinal fluid, he nevertheless expressed some doubt as to the specificity of certain of these mild reactions observed by him.

Some observations have been made relative to the effect of treatment upon the goldsol. Lange found the reaction to follow the effect of the treatment very closely. Kaplan and McClelland found that the paretic curve persisted even under treatment, while Esbuchen once saw it alter to the curve considered characteristic of tabes dorsalis. Miller and Levy have reported very marked changes in the paretic curve following treatment. Others who have noted the effect of treatment voice a difference of opinion as to whether the reaction can be made to disappear absolutely—become negative—as a result of the therapy. Some, at the one extreme, claim that the reaction, once present, never disappears, even under the most intensive treatment.

The question arises as to how this reaction compares with the findings in the cerebrospinal fluid with other methods—the Wassermann, cell and protein content. In a general way, it may be stated that all four are quite parallel, but it is believed that the goldsol is more delicate than any. This latter claim is made by some because a positive (luetie zone) goldsol is obtained when all other reactions are negative, that none of the others are positive with a negative goldsol, and because, under treatment, the goldsol is most persistent. DeCrisis and Frank have given the percentage of positive tests by the different methods in 83 cases of tabes and paresis as follows: cell count 64 per cent., Wassermann 72 per

cent., Nonne 84 per cent., goldsol 100 per cent. Jaeger and Goldstein alone assert that the goldsol does not agree with the Wassermann and that they are not parallel in given cases.

We may summarize the foregoing opinions, as recorded in the literature, briefly as follows: The Lange colloidal gold test for protein in the cerebrospinal fluid gives positive results with most syphilitic and some non-syphilitic diseases of the central nervous system. These positive results may be differentiated, first, according to the zone in which they occur, and, secondly, according to the depth of the individual reactions in a given zone. In the luetic zone the curve for paresis is almost constantly characteristic, while those for cerebrospinal syphilis and tabes dorsalis are not so; the test cannot be used safely to differentiate these diseases and certain mild reactions must be interpreted as negative and non-specific. The test parallels fairly closely the Nonne, cell-count and Wassermann on the cerebrospinal fluid even under treatment, but is more delicate and may be used to detect the earliest involvement of the central nervous system by the syphilitic process.

Our own contribution is based on the study of one hundred and six patients, with few exceptions individuals with mental disease.\* The clinician and laboratory worker have in every case returned their findings in writing before one knew the results of the examination made by the other. In this way we have attempted to make our results as free from preconceived conclusions and prejudices as possible. With one or two exceptions only, cases thought to be reasonably clear clinically as to diagnosis have been taken in order to lessen the error as much as might be from that source. As an entirely satisfactory clinical history has not been available in many instances, the question of syphilitic infection and the treatment received cannot be answered as fully as might be desired. Instances where recent treatment is known to have been given are noted, as well as other remarks pertinent to the test.

In the tables will be found the detailed reports of the findings. In addition to the colloidal gold test, the Wassermann test with the blood-serum and cerebrospinal fluid, together with the cell-count and Noguchi butyric acid test for protein in the latter are recorded. In a number of cases the tests have been repeated, but such results are noted in the tables only where a variation was found or where confirmation was thought desirable. In no case have we used a fluid which showed more than a barely perceptible tinge of blood, the absence of blood being determined in each instance microscopically.

Although the tabulated results are more or less self-explanatory, we wish to emphasize certain features because of the particular way in which they touch upon the question of the diagnostic value and accuracy of the Lange test.

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\*With few exceptions all persons examined have been patients in my service at the St. Louis City Sanitarium. The laboratory work has been done entirely by Dr. Ives. I am indebted to Dr. James Lewald of the City Sanitarium staff for performing nearly all the spinal punctures and for his assistance in the clinical examination of the patients. To my colleague, Dr. M. A. Bliss, I am indebted for re-examining with me the cases in which a diagnosis has not been in accordance with the laboratory findings. (F. M. B., Jr.)

No.	BW.	SFW.	WBC.	Noguchi	Lange	Diagnosis and Remarks
1	+	++	34	+	444453210	<i>Paresis</i>
2	++	+	5	+	5555432100	
4	++	+	24	+	4444432100	
5	+	++	60	+	1544321200	
6	+	++	36	+	5555432100	Blood trace
7	++	++	25	+	5555543210	Blood trace
8	++	++	30	+	5555543210	Blood trace
9	+	+	26	+	4455543210	
12	—	—	10	+	0000000000	Blood trace
13	—	—	9	—	1111000000	Repeated
14	++	++	40	+	4554443210	
15	++	++	11	+	3443221100	Trace blood, treatment
16	++	++	10	+	5555443210	
19	+	++	60	+	4554443322	
20	++	++	40	+	445552100	Trace blood
22	++	++	40	+	5555534100	
24	++	++	90	+	555555210	Trace blood
29	—	++	39	+	4443332100	treatment
30	++	++	55	+	555555521	Trace blood
34	++	++	10	+	5555532100	
35	++	+	10	+	3445421000	Treatment
39	++	—	2	+	1233210000	
43	++	—	140	+	1112353210	
45	++	—	—	—	1122100000	Repeated
48	++	+	4	—	1122321000	
52	—	++	80	+	2335432100	Repeated
53	++	++	75	+	2235542100	
55	++	++	50	+	2334543100	Repeated
60	++	++	102	+	2444554210	
61	++	++	40	+	4555555210	Treatment
	++	++	12	+	5555553210	
	++	++	34	+	5445543210	
	++	++	200	+	1454332110	
	++	++	25	+	0543332020	



65	++	++	++	++	40	4545432100	Treatment
68	++	++	++	+	3	0000000000	Repeated
76	++	++	++	++	3	1122210000	Trace blood
78	++	++	++	++	65	2534533210	Repeated
79	++	++	++	++	80	5555432100	
84	++	++	++	++	22	5545533321	
86	++	++	++	++	27	4455545332	
88	++	++	++	++	30	4445332110	
93	++	++	++	++	105	5554543211	
99	++	++	++	++	10	4555532100	
18	++	++	++	++	70	5545321000	
32	++	++	++	++	26	5555553100	
82	++	++	++	++	27	4445421000	Juvenile paresis
74	++	++	++	++	10	5555542100	Taboparesis
107	++	++	++	++	34	5555432210	Taboparesis
	++	++	++	++	—	0112110000	Tabes plus psychosis
	++	++	++	++	11	1123321000	Tabes plus hemiplegia
11	++	++	++	++	6	0012321100	<i>Syphilis of nervous system</i>
36	++	++	++	++	2	1123210000	Treatment
38	++	++	++	++	65	2335432100	Treatment
44	++	++	++	++	220	1234542100	Plus alcoholic dementia
46	++	++	++	++	4	1123321000	
51	++	++	++	++	—	0112211000	
56	++	++	++	++	165	233244331	
57	++	++	++	++	130	0123432100	
58	++	++	++	++	40	1234432100	
72	++	++	++	++	6	0000000000	
75	++	++	++	++	1	0011221100	
81	++	++	++	++	54	0122221000	
85	++	++	++	++	2	1131100000	
87	++	++	++	++	2	0001110000	
89	++	++	++	++	90	4445321000	Trace blood
94	++	++	++	++	70	4555532110	Repeated four times
96	++	++	++	++	53	0012321000	Treatment
	++	++	++	++	3	1103212100	

No.	BW.	SFW.	WBC.	Noguchi	Lange	Diagnosis and Remarks
95	++++	—	4	—	1223210000	Plus dementia præcox
3	—	—	—	—	0000000000	<i>Dementia præcox</i>
17	—	—	2	—	2235321000	Trace blood
25	—	—	2	—	1121100000	Repeated
26	—	—	2	—	1223211000	
27	—	—	3	—	1111100000	
33	—	—	4	—	0122100000	
40	—	—	2	—	1223210000	
41	—	—	—	—	1122100000	
42	—	—	4	+	1122100000	Trace blood
54	—	—	—	—	0000000000	
59	—	—	5	—	0000000000	
63	—	—	3	—	0000000000	
66	++	—	5	—	0000000000	
67	++	—	2	—	0000000000	
69	++	—	3	—	0000000000	
70	—	—	—	—	0000000000	
83	—	—	5	—	0111100000	
90	—	—	12	—	1233210000	Specimen one week old
91	—	—	2	—	1112100000	Specimen one week old
98	++++	—	3	—	0122100000	<i>Non-syphilitic diseases of central nervous system</i>
21	—	+	4	—	0001100000	
23	—	—	4	—	1233322100	
28	—	—	—	—	1233321000	
47	—	—	2	+	1112110000	
92	—	—	2	—	0123210000	Specimen one week old
100	++	—	3	—	0000000000	

37	—	—	—	3	—	—	—	1122110000	<i>Epileptic, defective, etc.</i>
49	—	—	—	3	—	—	—	0000000000	
50	—	—	—	2	—	—	—	0000000000	
71	—	—	—	7	—	—	—	0000000000	
73	—	—	—	4	—	—	—	0111221100	
77	—	—	—	1	—	—	—	0000000000	
101	—	—	—	3	—	—	—	0000000000	
102	—	—	—					0000000000	
64	++	—	—	2	—	—	—	0000000000	<i>Alcoholic dementia</i>
80	++	—	—					0000000000	
10	—	—	—	2	—	—	—	0000000000	<i>Manic depressive psychosis</i>
31	—	—	—	7	—	—	—	0122100000	
97	++	++	+					1113220000	
103	—	—	—	3	—	—	—	0000000000	<i>Senile dementia</i>
104	—	—	—	150	—	—	+	0112334321	<i>Tubercular meningitis</i>
105	+	++	++	2	—	—	—	1121000000	<i>Syphilis III (not CNS)</i>



*Paresis.*—Of the 40 cases of paresis examined, 2, or 5 per cent., must be considered entirely negative (Cases 12 and 68). In these 2 cases, the cerebrospinal fluid was also negative with the other tests used. Three others, or 7½ per cent., gave a reaction usually considered syphilitic (Cases 35, 39 and 43). Of these 3, in one (Case 43) the other tests were all negative, while one other (Case 39) showed a strongly positive reaction both in the blood and cerebrospinal fluid (WR., cell count and Noguchi). With these exceptions, all the cases in this group show a fairly uniform parallelism. From our results, we regard a reaction with a predominance of 4's and 5's in the first several tubes as strongly indicative of paresis, though not pathognomonic or specific. It is to be noted that in some instances the first tube shows only a slight or no reaction. Just how to explain this variation is uncertain, but we believe that it does not by itself militate against the diagnosis of paresis. As to the 3 entirely negative cases, doubt may be raised as to the accuracy of the clinical diagnosis. This applies to one case (No. 68) especially, in which there is considerable doubt. In the other cases the clinical diagnosis seems quite certain and has been made independently by several clinicians. In the 3 cases regarded as not giving characteristic curves for paresis (Nos. 14, 34, 45), we may have been too strict in our interpretation of what should constitute a characteristic curve. In each of these the precipitation occurred throughout the first several tubes, varying from 2 to 5 in intensity. It should be noted that 2 of these had recently received energetic antisyphilitic treatment; 1 intraspinal salvarsan. In summary then, we have 2 cases entirely negative, 3 not characteristic and 3 which gave syphilitic reactions. Thirty-two, or 80 per cent., show the characteristic curve for paresis. In addition, one juvenile paretic and two taboparetics gave the paretic curve.

*Tabes Dorsalis.*—Only 2 cases have been examined. In one, undoubtedly a case of tabes of some thirty years' duration, all reactions were negative. In the other we obtained positive results with a syphilitic Lange curve.

*Syphilis of the Central Nervous System.*—18 cases. Of these, 5 were quite negative, positive results having been obtained in 72½ per cent. of the cases. In this group one meets with a serious difficulty in deciding just what may be regarded as a positive reaction. In our work we have considered as positive reactions only such wherein the intensity has reached at least the grade of '3' and where four or more tubes in the luetic zone have shown some change in color; that is, some degree of precipitation. It should be noted that with syphilitics we may obtain a curve identical with that found in paretics (compare Cases 38 and 45). We may obtain a positive Lange when the other reactions are

entirely negative (Case 36). In this instance treatment had recently been active. On the other hand, we have observed a negative Lange with the other tests positive, particularly the Noguchi. The most important case in this group is one (Case 89) which gave a characteristic paretic curve. Clinically, most careful, repeated examinations by several clinicians over a period of five years have failed to demonstrate the paretic element in this case while the laboratory findings have been repeatedly positive as recorded. We are at a loss to interpret this result other than as evidence that the so-called paretic curve is not specific for paresis.

*Dementia Præcox*.—20 cases. Of these, 4, or 20 per cent., have given a positive luetic curve. It is significant to observe that in these 4 cases (Nos. 17, 26, 40, 90) the other reactions are entirely negative and that a history or clinical evidence of syphilis is not present. It is just such cases as these which raise a doubt whether these comparatively mild reactions can be considered at all indicative of syphilis. One case (No. 17) had long been looked upon as a paretic, but this diagnosis does not seem longer tenable under more complete history and examination.

*Organic, Nonsyphilitic Diseases of the Central Nervous System*.—6 cases. Of these, 3 gave positive syphilitic Lange curve with all the other tests negative. Similar comment applies to these cases as to the preceding group.

Of the remaining 16 cases, including several different clinical groups, one gave a positive Lange curve of the syphilitic type and one a positive curve of the non-luetic type. The first was a case of manic depressive psychosis complicated with organic features, which were not, however, clinically considered syphilitic. The second case was one of tubercular meningitis in which the tubercle bacilli were found in the cerebrospinal fluid. This reaction is that which has been described by others as occurring in this disease. As our series includes only this one case it seems hardly justifiable to draw any conclusions as to the specificity of the test when positive in the non-luetic zone.

How does the Lange reaction compare in these cases with the other laboratory tests for syphilis of the central nervous system which we have employed? Reference to the tables will show that in a number of instances the results by different methods do not agree with the findings by the Lange test. It is not uncommon to find a positive Lange when one or all of these tests are negative, that is, the serum Wassermann, the cerebrospinal fluid Wassermann, Noguchi and cell count. A positive Lange with a negative serum Wassermann is of no importance, because we know that other reactions may be negative in the serum while positive in the fluid. In our series we found a positive Lange with negative serum Wassermann, negative fluid Wassermann and cell count in 10 cases

and a negative Noguchi in 13. This has been a common experience of others. In 12 cases there was a negative Lange with a positive serum Wassermann; in one with a positive fluid Wassermann and cell count; in 6 with a positive Noguchi in the absence of blood contamination in the fluid.

From our experience with the goldsol reaction what deductions may be drawn? In the first place, may it be said that this test is characteristically indicative of syphilitic disease of the central nervous system? This makes necessary a consideration of the relative values of positive and negative results and a careful determination of what degree of reaction shall be interpreted as positive. It would appear that negative results are of no more value in excluding syphilis than is a negative Wassermann; that is, we may find a negative Lange in tabes, cerebrospinal syphilis or paresis. Mild reactions—those in which the color change reaches an intensity grade of less than three in any tube—must be regarded, for the present, as absolutely without diagnostic meaning. Reactions of slightly greater intensity, occurring in several tubes of the higher concentrations, are certainly suggestive of syphilis of the nervous system when considered together with other positive laboratory findings. When, however, these latter are negative, it is at least questionable whether we are justified in concluding that we are dealing with syphilis.

When the goldsol reaction occurs in the first several tubes and where there is a predominance of 4's and 5's, we feel that a diagnosis of syphilis of the central nervous system is justifiable, and, moreover, that paresis (or taboparesis) is probable. Our work fails to show any characteristic or typical curve for tabes or cerebrospinal syphilis, and a differentiation between these two by this reaction is not possible. Although the curve obtained in paresis is highly characteristic, it is not specific and may be met with in cases of cerebrospinal syphilis.

The goldsol test parallels fairly closely the Wassermann, cell count and protein content of the spinal fluid, but we do not find this parallelism invariably. We cannot agree that the goldsol is more delicate than other tests because we have found it negative, according to our interpretation, when they have been positive. Especially is this true of the Noguchi butyric acid test.

Certain difficulties in the preparation of the reagents and the performance of the test must be admitted. More important, however, we consider an adequate, practical experience which will enable one to make more accurate and uniform interpretations of reactions observed. We consider that none of these drawbacks detract from the essential value of the test. In spite of them, on the other hand, we believe that our experience justifies the conclusion that the goldsol test is a valuable addition to our laboratory diag-



nostic methods, and more especially is this true in reference to paresis.

With those reactions in the non-luetic zone we have had too little experience to permit of any conclusions.

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## HELIOOTHERAPY, ITS PHYSICS, PHYSIOLOGY AND INDICATIONS.

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### I. HISTORICAL.

Asklepios, illustrious and venerable son of Phoibos Apollo, thou removest all painful maladies.—*Orphean Hymns*.

The all important rôle of the sun for life was instinctively felt and recognized by mankind as far back as history goes. We find an expression of the ideas of the ancient nations in their mythologies. All the ancient nations—the Egyptians, the Assyrians, the Persians, the Greeks, the Romans, etc.,—and in America, the Aztecs and Incas, had temples erected for the worship of the Sun God. He generally represented a deity with good, benevolent tendencies, father of other gods, favorable to mankind, source of force, fertility, fecundity and health.

Æsculapius, the famous physician, was worshipped as a god and declared to be the son of Apollo, the Sun God of the Greeks. This expresses an idea common among all ancient nations—namely, that the sun-rays possess a strong curative power in disease and are an important factor for maintenance of health. A few examples suffice.

Herodotus describes, 484 B. C., how to administer a sun-bath; later, the Romans built in their public bath-houses (*thermæ*) special parlors for the exposure of the nude body to the sun and such solaria were found in the palaces of the rich. The Roman physicians used heliotherapy in a systematic way and in a multitude of diseases: arthritis, dropsy, leucorrhœa, elephantiasis, nervous disorders, etc.

Travelers in Central America have reported that the natives use to-day, as centuries ago, the sun-bath for the cure of tuberculosis, syphilis and rheumatism.

If the philosophers of old exalted the sun as the source of life and its influence on health, the science of modern times has been slow to accept its rôle in our terrestrial affairs. Sun-rays as a therapeutic agent were used in the last century by a few physicians (Rikli, Austria; Lahmann, Germany; Melander, Sweden; Snequireff, Russia; and others), but it was Finsen and his followers (Maag, Busk, etc.) who gave a strong impulse to the study of the action of the sun-rays on the human system in health and disease. The brilliant results of Finsen, of Rollier and Bernhardt (Switzer-

land), of Poncet (Lyons), and of Kellogg, in this country, attracted more and more attention in the medical world. Many articles on this topic are now seen in medical journals.

What is clearer and brighter than light? And is there a subject more obscure for the layman and, alas, for many physicians also, than the sun and its influence on the vital functions?

## II. THE PHYSICS OF THE SUN'S RADIANT ENERGY.

All the forces of the earth, and all the manifestations of life, are variations of the same celestial melody, vibrating from the sun through the spaces.—*Tyndall.*

The spaces through which the celestial bodies move are thought to be filled by an infinitely light matter called ether. The ether pervades also all matter by surrounding the molecules or minute particles of which all matter is composed. The molecules are continually vibrating more or less intensively, according to their degree of heat. Through this vibration the molecules promote a wave motion to the surrounding ether, just as a pebble thrown on the surface of a pond causes ripples. The only difference is that the ether wave is spherical, *i. e.*, moving in all directions from the centre of the impulse.

In this way the vibrations of the molecules composing the matter of the sun, very strong because of the enormously hot temperature, move in all directions through space.

The waves travel at a rate of 186,500 miles per second, which means a speed of over seven times around the earth in one second. As the distance from the sun to the earth is about 90,800,000 miles, consequently it takes eight minutes and a few seconds for the sun-rays to reach our planet.

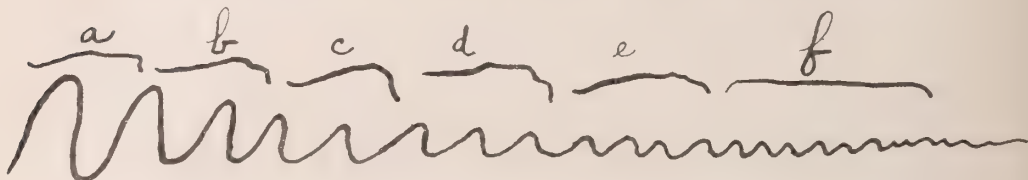
The senses of our body, when unaided by instruments, are able to recognize only heat and light in the solar rays, but by scientific observation it has been found that the vibrations emitted from the sun contain energies or waves of many different kinds. They all travel at the same rate, 186,500 miles per second, but they differ in wave length and number of oscillations per second.

If a sunbeam—a 'pencil' of light—is made to enter a dark room, and a prism is placed in front of it, the white sunlight is reflected or dispersed, and when falling upon a screen, the different colors of the rainbow are observed. This is the spectrum visible for the retina of the eye. The red color is at one end, and the violet at the other. Between are orange, yellow, green, blue, indigo, in all seven colors. But in the solar spectrum are rays that our eye cannot distinguish. Below the red are the infra-red or heat rays—a thermometer placed there shows their existence—and above the violet rays are the ultraviolet, acting strongly on a photographic plate when placed there. The sun emits still other rays, for in-



stance, below the infra-red are the Hertz waves and N-rays, and above the ultraviolet are waves corresponding to the  $x$  or Roentgen rays. The rays at the lower end have a greater wave length and lower frequency per second; higher up on the spectrum, as the wave lengths become smaller, the frequency increases, for all these vibrations travel, as we have seen, with the same speed, 186,500 miles per second, and it is evident that all wave lengths multiplied by their frequency per second must equal 186,500 miles.

The following diagram may illustrate the most typical rays:—



a, Hertz waves; b, N waves; c, heat waves; d, light waves; e, ultraviolet rays; f,  $x$ -rays.

In the following table the wave lengths of some of these rays are shown:—

Infra-red (heat rays) above.....	7500 Å
Visible light rays.	
Red. . . . .	6630 to 7500 Å
Orange. . . . .	6000 to 6600 "
Yellow. . . . .	5400 to 5830 "
Green. . . . .	5000 to 5330 "
Blue. . . . .	4570 to 5000 "
Indigo. . . . .	4340 to 4500 "
Violet. . . . .	3900 to 4300 "
Ultraviolet . . . . .	below 3900

The unit of measurement for waves, generally adopted is the Å (Ångström, a Swedish physicist). One Å is 1/10,000 of a micron; 1,000 microns are one millimeter. As there are 25.4 millimeters to one inch, one inch represents 254 millions Å.

The number of vibrations per second is 451,000,000 millions for the red and 789,000,000 millions for the violet rays.

The scope of this article does not allow a deeper study of the different waves (frequencies) emitted by the sun, and we will only give a short description of the principal groups, and mention briefly their characteristics.

*Electrical Waves.*—These have a very great wave length; the largest of them originate from storms in the sun (sun-spots) and may cause disturbances in the meteorological and magnetic conditions on our planet.

*Hertz waves* are 'electrical waves' of shorter length and higher frequency. They are identical with the electrical oscillations used in wireless telegraphy and were first described by Prof. Hertz, of

Germany (1886). These waves are called electrical because they can be produced by electrical apparatus, such as the Leyden jar and the Ruhmkorff, but it should be borne in mind that the sun does not emit electricity to the earth but ether vibrations. These can be and are, however, frequently transformed into electricity.

There is no doubt that these electrical waves from the sun exert an action on the animal organism, and probably a beneficial one, just as the electrical vibrations, artificially produced, (high frequency currents) which are so much used therapeutically. They bear a certain relation to the currents which traverse the nerves in their action on the vital processes.

*N-rays.*—These waves first described by Blondlot, of Nancy, (Nancy=N), in 1903, should be probably placed in the gap existing between the shortest electrical (Hertz) rays and the longest infra-red (heat) rays. But it may be noted, however, that some physicists place them at the higher end of the spectrum between the ultraviolet and the *x*-rays. The question is not yet definitely solved. That the N-rays exist in the solar radiation, and influence the animal cell has been shown by Charpentier, who observed that the luminescence of the glow-worm increased upon exposure to the N-radiations from the sun.

N-rays can be artificially produced in a multitude of ways. Compression of matter, such as wood, metals and caoutchouc create them. They are emitted both by lower and higher animals, both by muscular contraction and by irritating a nerve. The brain during activity emits N-rays, and it has been shown that they radiate from the centre momentarily in action. For instance, during speech, they are radiating from the region near Broca's convolution.

We know still very little of the action of the solar N-rays on the animal organism.

*Heat Rays.*—These rays are not normally visible to our eye, but can be felt by the nerve endings in the skin and easily detected by a thermometer. If the spectrum is observed through a dark red glass, cutting off the shorter rays, the retina can recognize sun-rays far beyond the 7,600 Å limit. (See above.) By a sensitive instrument (bolometer), heat rays up to a wave length of 24 microns (=240,000 Å) have been observed. They touch the region allotted to the N-rays.

*Visible Rays.*—We have already pointed out that the visible spectrum embraces all rays between a wave length of 7,600 (red) and 4,000 (violet). It is easy to calculate that there are 33,000 vibrations of the red and 63,000 of the violet to the inch and that the number to the second extends from 451,000,000 millions to 789,000,000 millions. The rays falling in this group of solar rays are but a very small part of the solar spectrum, but they are the most

important for the living organism. Although we call them luminous or visible rays to distinguish them from the dark heat rays, we should not forget that they also cause elevation of temperature. The longer the waves, the more heat effect. The red rays are thus warmer than the violet.

The infra-red and the visible rays are the most important for all terrestrial life. As to man, he obtains his food, heat and light from them. Civilization and progress depend ultimately on them; they are producers of electricity. But we come now to a group of waves in the solar radiation, which, although not perceived by our bodily senses, are of great importance for life and health. They are the ultraviolet rays. These waves have a wave length less than 4,000 Å. The shortest wave length recorded by an instrument is 1,000 Å, or 254,000 to one inch. How far they extend into the spectrum, that is, which are the smallest wave lengths, having the properties of this category, is still unknown, but it seems probable that the shortest are merged into rays identical with *x*-rays artificially produced.

The ultraviolet rays are also called chemical rays, because they possess a powerful chemical action. Passing through the atmosphere, they link oxygen atoms together, forming ozone. This ozone destroys organic impurities of the air, including bacteria, and the ultraviolet rays can thus be considered the scavengers of the atmosphere. The bulk of these rays are consumed in this work and only a small part, those with a larger wave, 4,000-3,800 Å, reach the surface of the earth. In high altitudes, however, where the rays have a considerably thinner layer of air to traverse, the sunbeams contain many more ultraviolet rays. As the skin is very sensitive to these rays, causing erythema and subsequent pigmentation, we can understand why the sunshine on high mountains causes inflamed and tanned skins, despite the low temperature. In the neighborhood of cities, over which the air is always more or less filled with dust, ultraviolet rays can only occasionally be found in the spectrum.

These rays kill bacteria in water very quickly and they are thus Nature's disinfectant of streams, lakes and oceans. Artificially produced, ultraviolet rays are used for therapeutic purposes, *e. g.*, in skin diseases, and for sterilizing water in water plants.

*X- or Roentgen Rays.*—There is no doubt that the sun emits rays of the same extremely short wave length as the artificially produced *x*-rays, but there is not as yet a direct scientific evidence for this statement. They are probably absorbed by the highest layers of the atmosphere or reflected into space.

### III. THE SUN'S RADIANT ENERGY AND THE BODY.

The human organism, like the plant, is able to draw directly from the solar radiation, and without effort, an important part of the energy necessary for the maintenance of life.—*De Laroquette.*

All the energy necessary for the vital functions is not derived from assimilated food (endogenous energy). The body is a con-



stant recipient of energy directly from the surrounding medium and distant sources. We receive heat waves from the sun and from all objects that surround us. We receive light waves from the sun directly or reflected as diffused daylight. Electrical currents and discharges from outside sources penetrate our bodies constantly. There are still the so-called 'cosmic influences' acting on our organisms, although we know very little about them. We cannot restrain ourselves from admitting that all these energies, received from the outside, must necessarily play an important part in the physiology of the body. It is therefore extraordinary to find that this subject is either totally overlooked or only lightly touched upon by the textbooks of physiology. Here is certainly a large field for scientific research work to be performed in the future.

For the sake of completeness we may mention in this connection that exogenous energy enters the body also by means of mechanical force. The additional energy thus received is undoubtedly important for persons of low vitality. Mechanotherapeutic methods, such as vibration, oscillation, passive movements, massage, etc., convey new energy to the patient directly, besides their action as stimuli to metabolism and nerve and muscle action.

In the same way electricity used therapeutically conveys, no doubt, exogenous energy to the body, besides causing the cell to transform some of its endogenous (potential) energy to kinetic energy. This is especially true of the high frequency currents which are able to supply trophic force to diseased tissues.

But the most important of exogenous energies conveyed directly to the organism are, however, the ether vibrations emanating from the sun.

Beginning at the lower end of the spectrum we have first, the electrical rays, the Hertz and N-rays, about which very little is known as to their influence on the organism, as already stated above.

The heat (infra-red) rays are, in return, indispensable for the body economy. If the body absorbs them by direct exposure to the sun, or indirectly through radiation from terrestrial objects, earth, air, heated dwelling houses, etc., they have the same effect: they assist the organism to maintain the body temperature with a smaller expense of its own fuel. In the tropics a man can do a reasonable amount of work with a daily intake of only 2,000 to 2,500 calories of food a day. In a cold climate a man working out of doors needs 4,000 to 5,000 calories a day. In an absolutely low temperature, man could not exist, his body could not produce heat enough to balance the loss by radiation.

Another effect on the body caused by the heat rays is the production of electricity. Every time the temperature of a point of the body is decreased through radiation, or increased through absorption of heat rays, electricity is produced. This can be proved by

a sensitive galvanometer. The point in question becomes negative in relation to the rest of the body. The current thus produced is called action current. Although we do not know much about the rôle of this electricity in the body economy, we must believe that Nature, as a perfect economist, has its way of saving and using the energy thus produced.

The light rays represent the climax of efficiency and importance to the organism, and convey to us a large amount of exogenous energy. The light rays from the sun (from 3,900 to 7,500 Å) reach the body either as direct rays or reflected. Our clothing shuts out the greater part of these light rays (a too great part!), and another part is reflected from the body; the whiter the skin is, the more. The more pigment the skin contains the more is absorbed. The black-skinned negro absorbs practically all the light rays falling upon the exposed parts of his body.

The rays absorbed by the skin and underlying tissues convey undoubtedly to the body a valuable supply of energy. How is this energy conserved?

Finsen placed a photographic plate under the lobe of the ear and exposed the ear to the sunlight. No impression on the plate followed after five minutes. But when he compressed the ear between two glass plates, for rendering the tissues ischemic, the photographic plate darkened in twenty seconds. This proves that it is the blood corpuscles that absorb the light rays. Malgat and others claim that when the body has been exposed to the sunlight a certain length of time, a photographic plate placed on a shaded part of the body is acted upon, and explains this fact by the theory that the blood, after having been saturated with sunlight, conveys this energy to all parts of the body and can even radiate the same (Rivier, Aimes).

That the light rays really convey a large amount of new energy to the body must be concluded also from our daily experience. When anemic, rachitic children are taken from dark tenement houses in the large cities and are given plenty of sunlight, they recover quickly. The fact that many lower animals both in water and air are attracted by the light (phototaxis) is explained by the theory that they draw direct energy from the light rays. Everybody has noted how insects of all kinds gather around electric arc lamps and seem to enjoy life immensely.

The light rays contain also a great number of heat rays, especially the red and orange frequencies, and what is said of them above holds true here also.

Substances capable of absorbing rays of small wave length, for instance, ultraviolet (invisible), and emitting rays of greater wave length, thus becoming luminous, are called fluorescent. Such is,

for instance, platinum cyanide used in the *x*-ray technique. Substances that have the inverse power, *i. e.*, transforming rays of a greater wave length, for instance, red, to more refrangible rays, are called sensitizers. Such a substance is chlorophyll in the plant cell, transforming light rays to the chemical rays necessary for the anabolic process of producing carbohydrates from  $\text{CO}_2$  and  $\text{H}_2\text{O}$ .

There are, in the human body, both fluorescent substances and sensitizers. The blood and lymph are fluorescent substances (Cleaves). They can transform chemical and light rays to heat. But the blood, and especially the red corpuscles, can act also as sensitizers, transforming rays of lower frequency into higher waves, *e. g.*, chemical waves. The body needs these rays for certain metabolic processes and probably also for their bactericidal properties. These cells seem thus to have a selective power in the use of the sun-rays, transforming them to different kinds of vibrations as needed. Very little is known as yet about this wonderful faculty of the organism to utilize the light and other rays, but enough, however, to understand that the energy of the ether vibrations is of the utmost importance for the body economy, and especially in combating disease.

Ultraviolet rays reach the surface of the earth only in small amounts, and the quantity of the energy they convey to the organism is consequently small, but by their powerful chemical action they become important. They do not penetrate as deep in the tissues as the light rays, but are absorbed by the epidermis.

Finsen painted portions of his forearm with India ink and found after an exposure of three hours that an intensive erythema had developed except in the portions protected by the ink. Here is the explanation of the fact that a negro's skin is protected from the chemical rays; it converts them into heat rays. If the sun is allowed to act gradually on a white, unpigmented skin, a pigmentation is developed, protecting the tissues from an excessive influence of the sun's chemical rays. Zimmern says that the pigment can be considered as a multitude of thermic foci, transmitting the energy to the blood-plasm circulating beneath.

#### IV. THE THERAPEUTIC ACTION OF THE SUN-RAYS.

In the hospitals of to-morrow a room for sun-baths will be as indispensable as the laboratory and *x*-ray rooms are to-day.—*Jaubert*.

The sun-rays act indirectly on the health by the bactericidal properties of the actinic rays (violet and ultraviolet). The bacteria of the atmosphere, in water or in soil, are killed when acted upon by the sunlight. The air we breathe is thus continually purified. In this way, also, polluted water exposed to sun-rays, *e. g.*, in rivers or lakes, is freed from typhoid and other bacteria. Tuberculosis bacilli in sputum, expectorated on the ground, are rendered innoc-



uous. This disinfection is the more effective, the higher the altitude, for the ultraviolet rays are more abundant in high altitudes.

The ozone, so stimulating for the organism, is produced by the action of the sun-rays.

As to the direct influence of the solar radiation on the human body, there is no divergence of opinion among physicians as to the importance of sunshine for the maintenance of health, and about its beneficial action in convalescence, wasting diseases, neurasthenia and anemia, etc. But enjoying sunshine in the popular way, that is with the body more or less covered with clothing and without method or system, is not heliotherapy. It is only a tasting from the cup filled with the Elixir of Life that Nature tends the sufferer; it is the use, in very homeopathic doses, of a most powerful remedy that should be taken in 'full therapeutic doses,' when prescribed by a skilful physician and when used under his supervision.

The prominent scientists, who have brought heliotherapy to the front in the last few years, and have gained world-wide reputation by their studies of the question and their remarkable cures in a diversity of diseases, emphasize the two following rules: The exposure to the sun-rays should be direct and it should be total. (1) It should be *direct* because any interposed material absorbs the most valuable—the ultraviolet rays. All clothing, even the thinnest gauze, is objectionable for the same reason, but also because it interferes with the circulation of the air to the skin. (2) The exposure of the body should be *total*, whenever possible, as only in this way have the best results been obtained. (The head should, however, be protected.) Exceptions to this rule are treatments of laryngeal affections (Klebs, Sorgo, Alexander), and of tuberculous conjunctivitis (Borel, Rothe, and others).

In this connection it may be mentioned that mucous membranes can endure a longer and more intensive exposure to both solar and artificial light than the (unpigmented) skin (Borel).

Another limitation to the rule of total exposure is that patients, during the first three or four days, should be trained to the full sun-bath. Hensler, for instance, allows his patients to expose only the legs the first day, the legs and thighs the second day, the third day he adds the abdomen and the fourth day he allows a full exposure. The duration should also be increased gradually, according to the general condition of the patient.

But in the vast majority of cases, even when the manifestations of the malady are local, for instance in cervical adenitis, gonarthrititis, infected wounds, etc., a total exposure is of the utmost importance. The explanation is not difficult. If we consider, for instance, a case of hip disease with discharging fistulæ that has been completely cured by heliotherapy, it is evident that the actinic rays, with their germicidal properties, could reach directly only an infinitely

small amount of the tubercle bacilli in the system. Their most important action was to stimulate the production of antibodies, and thus in an indirect way free the system from the tuberculosis parasites. The larger the area of the body exposed, the larger volume of blood (and lymph?) is acted upon by the actinic rays and the more antibodies are formed. Rikli, 'the father of heliotherapy,' called attention to the increased resistance to infectious diseases in persons having used heliotherapy systematically.

Rollier reports that during an epidemic of varicella, those patients who had taken sun-baths for a longer period and whose skins had become pigmented, were spared, while all others early became victims of the epidemic. He asserts also that they became immune against acne and furunculosis.

Piazza, Kitasato, and others have found, experimentally, that the bacterial toxins lose considerably in strength after sunbathing.

This question of the increase of the defensive power of the body after the absorption of solar rays, and especially the formation of antibodies of different categories, would form a large and interesting field of research and clinical experimentation.

As the amount of actinic rays is greater in high altitudes, it was thought for a long time that the successful treatment by heliotherapy could take place only in mountainous regions. But Kellogg and Emmett, of this country, Bardenheuer (Cologne), Lahmann (Dresden), Dufour (Paris), Révillet, D'Espine (Mediterranean littoral) and many others have obtained excellent results at low altitudes. It seems that in many cases, for instance, febrile conditions, the treatments even show better results in low altitudes, and especially when given at the seacoast. Cases of surgical tuberculosis, on the contrary, do very well in the mountains.

Many authorities on heliotherapy ascribe much importance to the pigmentation of the skin. But besides this effect of the sun-rays it must be remembered that the light and the air also restore the skin—this important organ—to its normal functions of heat regulation and secretion, when it has lost its vitality by too much protection from air and light. In many skin affections, and especially in lupus, eczema, and erysipelas, heliotherapy has given excellent results. Paradoxically enough, burns, even extensive ones, heal quickly (Bernhardt, Oeconomus, and others). That wounds, both traumatic and operative, heal quickly has been proved by many (Bloch, Bernhardt, etc.). Jaubert treats varicose ulcers by exposure to the sun.

The metabolism is increased in a remarkable way. The absorptive and eliminative power of the cell is heightened. The sun-bath acts thus as a strong tonic. The appetite is increased, the digestion activated, and the secretion through kidneys and skin is increased. Bernhardt, Kitasato, and others found an increase of eliminated

bacteria and toxins in the urine. The effect on the circulation is an activation of the cutaneous vasodilatation. This increase in the peripheral circulation assists the heart greatly. The blood-pressure is, of course, lowered. There is a notable increase in the number of red blood cells and in the percentage of hemoglobin.

During a sun-bath, respiration becomes, at first, accelerated and then returns to the normal rate, but the quantity of carbonic acid exhaled increases 13 to 15 per cent. (Moleschott, Fubini).

The action on the nervous system is considerable. This is evident when one remembers what we demonstrated above concerning the amount of energy derived from the light rays. This energy is received not only by the blood-plasm and cells but also by the mass of end corpuscles in the skin, and transmitted to the whole nervous system (de Laroquette). It gives the neurasthenic patient a sensation of euphoria, to a remarkable degree.

To many physicians, heliotherapy is synonymous with treatments of surgical tuberculosis by solar rays. This notion is caused by the fact that the statistics of cases of surgical tuberculosis treated by heliotherapy published by Révillet (Cannes), in 1910, and Rollier (Leysin), in 1912, have been commented upon in all medical journals in the world, and the wonderful results obtained by these two specialists have thus become known to everybody. The heliotherapy has, however, been applied by other specialists in a diversity of diseases with brilliant results although these have not obtained such a world-wide notoriety. We referred above to the treatments of skin affections, but will mention a few other diseases and conditions where heliotherapy has been used.

In *constitutional* diseases, sun-baths have given good results. Kellogg, Singer, and others have reported improvement in diabetes and in gout. Denucé, Révillet, and others use solar rays in the cure of rachitis. Convalescents from various diseases, or after surgical operations, make a much quicker recovery by the use of sun-baths. In diseases of the blood, Rivier and others report cures in chlorosis and primary anemia; Kellogg also in leukemia.

In chronic diseases of the *alimentary tract* and *circulatory* organs, heliotherapy has been used by many. Delachasse made a report in June, 1913, to the Société Vaudoise about the regulating influence of the sun-bath on the intestinal peristalsis and the cardiac rhythm.

The tonic action of the solar rays on the *nervous system* has induced many specialists to use heliotherapy in various nervous disorders. The most remarkable results have been obtained in neurasthenia. Inveterate cases, rebellious to other treatments, have been cured by heliotherapy. Singer, of Berlin, combines the treatment with medical gymnastics. Treatment of nervous disorders by sun-baths has become quite popular in Germany, and in most of the



health resorts of that country the *Sonnenbæder* (sun-baths) are much in vogue.

In *gynecological* affections, heliotherapy was first used by Sneguireff, of Moscow, who published reports of cures in chronic inflammations of the uterus and ovaries. After him many others, for instance Guibert (Balaruc), Aimes (Montpellier), Singer, Badin, etc. have reported remarkable results.

Of *infectious diseases*, in which heliotherapy has been used with success, the most important place is held by tuberculosis, and especially 'surgical' tuberculosis. This subject has been treated in special articles in the JOURNAL. Among other infectious diseases, in which heliotherapy has been used, we may mention acute articular rheumatism (Kellogg, de Raquine, etc.), gonorrheal arthritis (Vedel), dysentery (Henocque).

In the solar radiation, we have a most efficient therapeutic agent with a wide application. It is, by no means, a general panacea, but the scope of diseases and conditions in which it is indicated is large enough. Heliotherapy is not, any more, in its empirical stage. Its scientific basis has been studied and firmly established. All signs point to an important place for heliotherapy in the medicine of the future.

We express the hope that this method may become more popular in this country and sun-bath galleries become a constant feature in up-to-date sanatoriums and hospitals.

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## HELIO THERAPY AND ITS SPECIAL APPLICATION TO PULMONARY TUBERCULOSIS.

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Heliotherapy is the term employed to describe the therapeutic application of light to disease. This means light in its broadest sense and comprises all forms of solar energy. In his discussion the writer will speak of light in this sense.

In order to understand light and its action upon the organism in health as well as disease, it is necessary to review some of the fundamental principles of light energy. While these can be obtained in books on physics, yet at the risk of repeating what is well known and without making claim to any originality, the writer will mention a few principles which will enable one better to understand light as a therapeutic agent.

Light energy consists of vibrations as does sound energy. White light is a combination of all the colors of the spectrum. Each color has its particular rate of vibration and its particular wave length. The spectrum consists of red, orange, yellow, green, blue, indigo and violet light, which are visible to the eye, and rays of longer vibrations than the red, and of shorter vibrations than the violet which are invisible. The latter, while invisible, are still potential. These various colors of the spectrum differ not only in wave length and rapidity of vibration, but also in their action.

Red light vibrates at the rate of 481 billions of oscillations per second; orange, 532; yellow, 563; green, 607; blue, 653; indigo, 676; and violet, 764. The invisible infra-red vibrates less than 481 billions and the ultra-violet more than 764 billions per second. Ultra-violet frequencies become shorter and shorter and merge into Roentgen waves. Accordingly, as various substances adapt themselves to these vibrations, they appear to us as being of different colors. The color depends upon the absorption and reflection of light vibrations. A substance which is tuned, so to speak, to absorb all wave lengths except those of 481 billions per second, would appear red because these vibrations would be reflected to the retina. Each wave length, as it is reflected, shows as its own color.

It is of importance to understand that the nature of energy engendered by these various rates of vibration differs materially. While light is light, yet the light ray means much more than this.

It means luminosity, thermal and chemical energy. These in turn depend largely upon the rate of vibration of the wave.

Light from different sources furnishes different spectra. In sunlight, the heat rays are found in the entire spectrum (see illustration), but they greatly predominate in the colors of long wave length, red, orange, yellow and green. The light rays are found in that portion lying between orange and indigo, with the maximum in the yellow. Chemical activity ranges from the yellow to the ultra-violet with the maximum activity being just short of the ultra-violet. The ultra-violet should possess the maximum chemical activity, but on account of the great absorption which takes place in these rays during their progress through the atmosphere, the maximum chemical

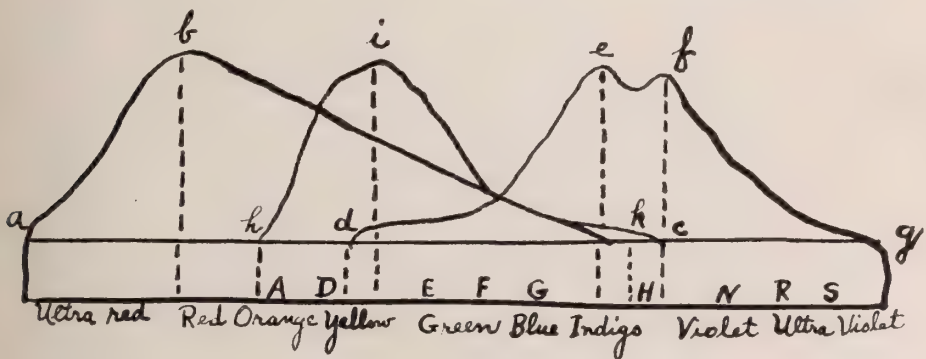


Fig. 1.—Showing the curves of heat, light and chemical energy found in the solar spectrum.

Line a, b, c, shows the curve of thermal energy extending from the ultra-red to the violet with the maximum energy in the red.

Line h, i, k, shows the curve of light energy extending from orange through indigo with the maximum energy in the yellow.

Line d, e, f, g, shows the curve of chemical energy, extending from yellow through ultra-violet with the maximum short of the violet.

(This figure is taken from A. Lainer's Lectures on Photograph. opt. Vienna, 1890, p. 107, consequently we assume that it represents the spectrum at Vienna. This would differ somewhat in other places according to the clearness of the atmosphere.)

action of sunlight is found short of the ultra-violet rays. This statement cannot be made without some modification, as the amount of ultra-violet rays which reaches the earth in different places varies greatly.

In passing from the sun to earth, the rays suffer great loss in energy. This loss is the greater, the shorter the wave length; hence chemical energy suffers more than thermal energy. Among the substances which cause the greatest absorption of chemical energy during their passage through the atmosphere are oxygen and nitrogen. Inasmuch as the sun's rays must pass through a much thicker layer of atmosphere in the morning and evening when



the sun is low, than at mid-day when the sun is vertical, the chemical rays suffer a corresponding greater loss in the morning and evening than at mid-day.

Langley\* found that the following percentage of the various colors of the sun's rays passes the atmosphere unabsorbed. It is not stated where these observations were made.

Ultra-violet. . . . .	39 per cent.
Violet. . . . .	42 per cent.
Blue. . . . .	48 per cent.
Greenish Blue. . . . .	54 per cent.
Yellow. . . . .	63 per cent.
Red. . . . .	70 per cent.
Infra-red. . . . .	76 per cent.

Sunlight contains large quantities of chemical energy. Even ultra-violet rays are plentiful in those places where the atmosphere is clear and the sun is bright, such as in the mountains, in the desert, in the semi-arid regions, and at sea. Smoke prevents the passage of the ultra-violet rays to a great extent, consequently the light of country districts is much stronger in ultra-violet light than that of cities. Haze and mist also interfere with their passage. Chemical rays are very strong at the seashore, and on large bodies of water generally, owing to the clear atmosphere and the water acting as a reflector for them. This accounts for the intense burns which are so common on or near the water, and the extreme pigmentation which occurs when the exposure is prolonged.

Light produces different effects on different plants; some grow only in bright light; others grow only in the shade; and still others grow only under water. The action of the various rays is different. The heat rays favor plant growth while the chemical rays retard it.

Bacteria are not killed by the heat end of the spectrum, while they are killed by the chemical rays, particularly the blue, violet, and ultra-violet. This destructive action seems to be partly due to a direct influence on the media in which the bacteria exist, and partly to a direct action on the protoplasm of the micro-organism. While the heat energy does not destroy bacteria, it renders the chemical rays more active.

While micro-organisms are unfavorably influenced by light, living organisms which are infected by them are favorably influenced by it in withstanding their deleterious effects and are aided in throwing off infection. This has been proved by comparing the effects of bacteria on animals left in the dark, after infection, with those kept in the light.

The action of light on animals is a very complex one. It quickens

\*Quoted by Freund: Elements of General Radio-therapy, Rebman, New York. 1904.

all vital forces. It stimulates the body cells and improves the functions of the organs. This action is either direct or through the blood, nerves and organs of sensation.

The effect of light on the skin is that of a stimulant or irritant, according to the time of exposure and the intensity of the light. If the skin is exposed to intense light for a long time it may become acutely inflamed; an erythema, or even blister resulting. If the exposure is more gradual, instead of acute symptoms resulting, a hyperemia ensues which is followed by hardening and pigmentation of the skin. This pigmentation is protective in nature and interferes with the further penetration of the rays. Both erythema and pigmentation are a result of chemical rays and are produced more quickly and more generally where the ultra-violet rays are found in greatest abundance.

One of the most important actions of light upon the skin is a dilatation of the capillaries which is persistent. In patients whom I have treated with chemical rays from sunlight focused from large mirrors in which the heat rays were cut off by blue glass, the dilatation has remained, as has the pigmentation, for as much as three years.

The question of penetration is important. How deep will light penetrate? Inasmuch as the most active portion of the spectrum from the physiological standpoint is that which produces chemical action, we will confine our discussion almost wholly to this. Unfortunately from the therapeutic standpoint, the most active portion, the ultra-violet, is the one which is absorbed to the greatest degree. These rays do pass through the tissues, however. Sensitized paper has been blackened by chemical rays after passing through the ears of rabbits. Solutions of nitrate of silver introduced under the skin of the dog and cat have also been blackened. Likewise, light has been shown to pass through the human hand and even the thorax and to produce images on photographic plates. It is very important to remember in the practical application of light in therapy that the penetration is not instantaneous. It requires time for the passage of the rays. While penetration of a rabbit's ear or the human cheek might take only a few minutes, it is necessary to expose the human hand twenty minutes and the thorax still longer.

Light has an important action upon the blood. Waves of all length are absorbed by it. Tissues containing blood greatly hinder the passage of the ultra-violet rays, as is shown by Finsen's experiment of placing sensitized paper behind the ear and observing the action of the light upon it. After five minutes no blackening was noticed when the tissues were full of blood, but after twenty seconds blackening was shown when the tissues were pressed between glass plates so as to express the blood.

As a result of the light bath the superficial vessels of the skin are dilated, bringing large quantities of blood to the surface which absorb the light energy, resulting in changes in the amount of hemoglobin and an increase in the number of corpuscles. Light energy is also transmitted to the blood elements, increasing their fluorescence. Thus light is able to transmit energy to the blood which stimulates every vital function of the body.

It has been shown that hemoglobin gives off its oxygen more rapidly in light than in dark, consequently light augments the oxydizing power of the blood.

Tissue change goes on more rapidly under the influence of light. This is probably due both to its action on the blood and the stimulation of the nerves. At times this is so rapid as to cause a loss of weight in animals subjected to continuous bright light.

Muscle contraction is stimulated by light, and animals are enabled to do more work when they live in light than in the dark. The hibernating animal wisely chooses the dark for his winter home and thus lives with the least expenditure of energy.

From the description of light thus far, it can be seen that it has a decided stimulating effect on the organism. The difference between stimulation and irritation is only a difference of degree. While even a very active light can be utilized to the advantage of the human organism, both in health and disease, yet, at times, the light is so active that it proves harmful. Experiments show that exposure to intense rays will cause a loss of weight as mentioned above, and increased nervous irritability. Both these conditions, particularly the latter, are often met in human beings, whether healthy or ill, who live in the clear atmosphere in the high mountains, or dry desert regions. We see the same thing, though to a lesser degree, in certain regions in California which are within fifty or seventy-five miles of the coast.

The question arises, can this intense energy found in light be utilized in the treatment of disease? If so, in what diseases and in what manner?

Without going into particulars, it can be seen that those diseases which may be benefited by a general improvement in tissue tone, and those superficial pathological conditions which may be improved by a hyperemia and increased bactericidal action, are especially suited to light therapy. Acne rosacea, acne vulgaris, sycosis, furunculosis, and lupus, are some of the bacterial skin affections which have been successfully treated. Syphilis, many of the nervous diseases, all forms of tuberculosis, anemia, and many other affections calling for general tonic treatment have been improved by light therapy.

It is well to bear in mind in the discussion of light in the treatment of any disease like tuberculosis, that it has no specific action.



It is not a cure for tuberculosis. It is only one means of making the patient stronger and more resistant to the infection, except in superficial tuberculous infections where two other factors enter—namely, the hyperemia produced by it and the direct germicidal effect of the chemical rays. Knowing the readiness with which the chemical rays of the spectrum are absorbed by the blood and tissues, we must not expect a high degree of direct bactericidal action where the pathological process is situated deep in the tissues.

Since the publication of the work of Rollier\* in the application of light to tuberculosis of the bones, joints and skin has attracted such universal attention, the writer thought it might be of interest to detail his experience in its employment in the treatment of pulmonary tuberculosis.

Naturally, the writer cannot offer the brilliant convincing results in this grave form of the disease that are offered in the localized forms of tuberculosis, but a discussion of its action in the pulmonary form of the disease and a consideration of the methods of employing it may be of help to others who are attempting to use it. During the past eleven years the writer has observed several hundred patients subjected to this form of therapy. Light energy has never been employed by him to the exclusion of other forms of treatment, because of his conception of it being not a cure for tuberculosis, but an aid to be classed with open air, good food, hygienic living, properly adjusted rest and exercise, hydrotherapy, and an optimistic mental attitude.

There are two methods which may be followed in the employment of solar energy. The patient may be stripped and the entire body exposed to the light, or the light may be reflected from large mirrors. When mirrors are employed, it is necessary to cut off the heat rays. This can be done by covering the mirror with blue glass which permits the reflection of the powerful chemical rays. These two methods differ greatly and are suited to different conditions.

The sun bath will vary in its efficiency according to its strength in luminous, heat and chemical rays. While the most profound effect on the blood and tissue change depends on the chemical rays, or frequencies, yet the result must be looked upon as being due to a union of all of the three forms of energy. As the chemical rays are strongest in pure, clear atmosphere, mountainous, desert or semi-arid regions, and the seacoast or ocean surface offer stronger effects than other regions and are consequently more suitable for carrying out this line of treatment. Country districts free from smoke are far better than cities, and that portion of the day when the sun is more vertical, furnishes a much stronger bath than the morning and evening. All these factors must be borne in

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\*Die Heliotherapie der Tuberkulose. Berlin. 1913.

mind in adapting the bath to the patient. Only such regions as have a large percentage of sunshine are adapted to light therapy.

The dosage of the sun bath is all important. A short bath has a decided tonic effect, while a prolonged one, if the heat energy is strong and not eliminated, will produce marked perspiration and have a depressing effect. If the heat can be eliminated by such means as cold douches to the surface, or artificially reducing the temperature of the surrounding air as is sometimes done in establishments for light therapy, or by cutting off the heat rays, then the full effect of the chemical rays can be obtained without the depressive effect.

The sun bath increases elimination through the skin, and in this manner should be a decided aid to tuberculosis, where so many factors are present which tend to increase toxin formation within the body. It stimulates general metabolic changes and through the blood and nervous system produces changes in most distant organs.

The effect of light on the blood is easily demonstrable. The city house dweller is pale compared with his country brother. In cold districts, people who remain much in the house are pale in winter and full-blooded in summer. Those who live in the intense light of the mountains, desert, and semi-arid and ocean regions are full-blooded compared with those who live in regions where the atmosphere is not so clear. This is well shown in children of our far West, South, and Southwest, compared with the pale children of other regions of our country. Light further improves the tone of the skin and acts as a general hardening factor, which is of great importance to the tuberculous in guarding him against colds and other acute respiratory infections.

When the atmospheric conditions are extremely favorable for light therapy, the exposure must be more guarded than when it is less favorable. The condition of the patient must be considered also. A patient with incipient or with inactive tuberculosis will stand the treatment well, but one with an active disease must be exposed very gradually. Inasmuch as in the ordinary sun bath it is usually impracticable to eliminate the heat rays, the dose of light must be regulated so as not to cause discomfort or marked increase of body temperature. The temperature will become somewhat elevated even in healthy adults after a prolonged sun bath; but in the tuberculous, in whom the vasomotor heat regulating system is always more or less disturbed, and particularly in those suffering from active disease in whom it is greatly disturbed, a very marked rise is apt to follow a too long exposure to the direct rays of the bright sun. Yet these patients can be given the beneficial effect of light if judgment is used. They cannot be forced too rapidly.

In our clear atmosphere in Southern California it is well to use the sun baths for those who are suffering from active tuberculosis,

in the early morning, beginning at eight or nine o'clock according to the season, taking advantage of the fact that the rays at this time of day possess much less energy than they do later in the day. The morning is preferred to the afternoon because temperatures are naturally higher in the afternoon than in the morning. For those who are stronger and suffering from incipient, inactive or arrested disease, the baths may be taken nearer the middle of the day.

The length, as well as the extent of exposure, is important. The first exposure should be of only a small portion of the body, and should be for only a few minutes. The legs, arms, chest or abdomen may be exposed first. The part is apparently not so important in itself. Most any patient with maximum daily temperature under 100° F. can stand an exposure of five minutes to any region of the body, except the head which should be protected; and this is the length of exposure that the writer would recommend as being safe for starting patients of this type. The length of exposure may be increased five minutes a day and the amount of surface exposed may also be gradually increased until finally the entire body is exposed for an hour. Sensitive patients or fever patients should be exposed to indirect light before direct rays are employed. Extreme judgment must be used, even in so seemingly simple a therapeutic agent as light. The patient must be watched. If weakness, faintness, headache, nausea, or any other symptoms referable to the light should appear, the exposure must be cut down in time or extent, or both. The head should be kept in the shade and it may be protected with cold damp cloths if necessary. Stronger patients, and those suffering from a less severe disease, may use the more energetic rays of the mid-day sun and may increase the exposure somewhat more rapidly, although they too must be careful not to increase the time or amount of exposure too rapidly.

When, on account of privacy, it is impracticable to expose the bare skin, very thin white garments may be worn. These will allow much of the light energy to pass through them.

Blondes do not endure the sun baths as well as brunettes. Their skin does not contain as much pigment, consequently they are not so well protected and are more apt to burn. Care must be taken until the skin has hardened. According to the writer's observation, the blonde also shows more nervous irritability than the brunette when exposed to the sunlight.

Woodruff has discussed this in a very entertaining and instructive manner in a book which deals with the effect of light on races.\*

The writer has had a larger personal experience in the employment of sunlight reflected from large mirrors (3 ft. in diameter),\*\* than he has in the employment of the full sun bath.

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\*Woodruff: *The Effect of Tropical Light on the White Man*. Rebman, New York.

\*\*The mirrors which the writer employs are especially adapted to institutional use. They were devised by Dr. Kime, of Fort Dodge, Iowa.



These mirrors are covered with blue glass to cut off the heat rays. They concentrate the light on a focus about 6 or 8 in. in diameter at a distance of about  $3\frac{1}{2}$  ft. from the reflectors. In this way there is a concentration of rays which affords a bath rich in blue, indigo and violet, and quite an increase in ultra-violet over what could be had in the general direct sun bath. If the patient sits in the sun, a large portion of the body is exposed to the direct rays of the sun during the bath and this proves to be a combined local bath of reflected concentrated chemical energy and a direct sun bath at the same time.

It has been the writer's habit to concentrate these rays on that portion of the chest of the patient which is the seat of the disease, beginning with an exposure of five minutes and increasing for five minutes a day, until an exposure of forty minutes has been reached. This limit seems to be about as much as can be well tolerated in the bright sun in our clear atmosphere. This should be varied, however, under other atmospheric conditions.

The effect of this form of treatment depends partly on the effect on the skin and superficial structures, partly on the effect on the nerve endings exposed and their reflex action, largely on the influence of the light energy on the blood which is bathed in it for this prolonged period of time, and partly on the penetration of the rays. It is impossible to ascribe to light the exact measure of its influence, for the patients are also receiving many other forms of therapy that have more or less the same effect.

One question worthy of consideration is, Do we get penetration, and if so, to what extent? Kime reports that he has reproduced photographic images through the normal chest with this reflector. Others report similar penetration with other methods of concentration of rays. Two experiences which make the writer think that penetration does take place clinically, at least to a limited extent, are first, a tendency to cough, which is often experienced by the patient if the early exposures, before the patient is accustomed to the treatment, are prolonged; secondly, a spitting of blood which sometimes follows too rapid and too prolonged exposure at the beginning of treatment. The writer has also noticed changes in the auscultatory note following an exposure as compared with the same note prior to exposure, but his later studies would cause him to question whether or not this might not be due to the changes which occur in the superficial tissues, since they are filled with blood as a result of the treatment. It seems that we may count on obtaining a fair degree of penetration by this concentrated bath, and if so, we are obtaining an effect much greater in energy than that produced by the simple sun bath when only the direct rays of the sun are employed.

From his experience with light in tuberculosis, the writer would

class it along with other tonic measures which build up the patient and make him more resistant to infection. It is not as universally applicable as open air, good food, hygienic living, hydrotherapy, optimistic surroundings and a carefully regulated life, because the particular rays which are most energetic in their therapeutic action, the chemical rays, are only found in large quantities in certain favored places where the atmosphere is clear, and are especially interfered with, in all regions where the atmosphere contains impurities, particularly smoke. Those who attempt its application in pulmonary tuberculosis will be disappointed if they expect to see certain immediate results. It is one of those matters which must be taken by faith. Knowing the physiological action of light energy, it appeals to us as being an aid, and as such it must be used. It must not be considered a cure for this grave disease. If it is, it will be another disappointment and soon be relegated to the past; on the other hand, if employed intelligently, with a full knowledge of its true worth, and a willingness to accept the measure of help which can be derived from it, it will take its place as one of the many measures which will help build up the sum of resistance in those afflicted with pulmonary tuberculosis.

## THE RADIOACTIVITY OF MOUNTAIN VALLEY WATER.\*

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By ERNEST ZUEBLIN, M. D., of Baltimore,

Professor of Medicine at the University of Maryland.

(From the Medical Clinic of the University of Maryland Hospital, Baltimore.)

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In the treatment of disease mineral waters have been recommended by patients and physicians as well. Much scepticism as to their efficiency is still entertained by the practitioner. With the discovery of radium and radium emanation in the different springs of this and the old country, our interest on this subject has been aroused. The work undertaken by the Government to ascertain the extent of radioactivity in the different mineral springs of our country merits the appreciation of the medical profession. Two years ago when in a similar study we examined the radioactivity of the mineral springs at Warm and Hot Springs, Va. (Hemmeter and Zueblin, *Arch. Int. Med.*, 1915, Vol. XV, pp. 188-203), only a few other springs in this country had been analyzed quantitatively for their radioactivity—Hot Springs, Arkansas (Boltwood, *Amer. Jour. Science*, 1905, Vol. XX, p. 128), Yellow Stone Park (Schlundt and Moore, U. S. Geological Survey Bull., No. 395), Saratoga Springs, N. Y. (Moore and Wittemore, *Jour. Industr. and Engin. Chem.*, 1914, July, p. 552, quot. *Jour. Amer. Med. Assoc.*, 1914, Vol. LXIII, p. 795). To my knowledge no quantitative analyses of the radioactivity from White Sulphur Springs, Va., have been published as yet.

Through the daily press and in the different periodicals the public and proprietors of the mineral springs have become aware of the advantages resulting from the presence of radio emanation in these waters. It cannot be prevented that a difference of opinion as to the usefulness of these waters from the commercial and medical standpoint may arise. For the medical profession it is desirable that besides the quantitative, chemical and radiological analyses, clinical observations should be made with the radioactive mineral waters placed upon the market. With such an aim the present investigation of the physical, radiological and clinical qualities of Mountain Valley water were started in the summer of 1913.

The present paper deals with the physiological and radiological results, whilst the clinical qualities of the same water will be entered upon in a later publication.

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\*Read before the Medical Society of the City of Baltimore, March 6th, 1915.

The water was furnished through the courtesy of the Mountain Valley agency at Baltimore, to whom I wish to express my appreciation.



*Radiological Examination of Mountain Valley Water as Sold on the Markets.*—The technique pursued in the test of radioactivity is as follows: The Mountain Valley water was tested from freshly opened bottles, and tests were also made with the water contained in larger tanks. The tests were started in July, 1913. The apparatus used was the Fontactoscope constructed by Guenther and Tegetmeyer in Braunschweig, as mostly used for the determination of radioactivity in mineral waters. The dispersing factor of the apparatus was 13.8. Preceding the test of the water, the electric conductivity of the tank, containing ordinary air, was ascertained by successive reading for one hour of the distance of both leaflets of the electroscope. Each fraction of the scale corresponds to a certain electric tension in volts, so the normal loss for each determination was ascertained. For each determination this normal loss had to be determined, as the determination obtained is subject to considerable variations according to the time of the day, the weather, the humidity of the surrounding air. If there was much humidity found, the electroscope had to be dehydrated by the introduction of a small amount of metallic sodium left in the capsule of the electroscope. This precaution reduced the normal loss considerably. It is important that the normal loss at least is determined for one hour. For shorter periods of observation a correction has to be introduced in the figuring of the final results. Shorter observations give too high figures for the normal loss.

After this preliminary determination the mineral water to be tested was carefully introduced into the tank; in the average cases 100 c.cm. of the mineral water are allowed to run to the bottom of the container, special precaution being taken to prevent a spilling or shaking of the water. The gas tank, hermetically closed by a rubber stopper, was then shaken for one-half to one minute. According to the content of carbonic acid, one must be very careful not to allow any overpressure which by forcing the rubber stopper causes an escape of emanation gas. This possible pressure is prevented by opening a side tap in the tank. After the shaking, the electroscope is rapidly adapted and charged with positive electricity which drives the leaflets apart. If any radioactivity is present, the electrical charge of the radioactive substances neutralizes the electric energy with which the leaflets are charged. The tension between these leaflets consequently is reduced and they tend to approach each other. The distance of the leaflets is read off in regular intervals in minutes, or fraction of a minute, according to the time at disposal for the observation. The readings in the given tests extended from thirty minutes to one hour. The figures represent the distance of the leaflets and correspond to so many volts as indicated on the table given, and warranted by the manu-

facturers of the instrument. For the calculation of the radioactivity the following example may be stated:—

Distance of the instrument at the beginning of the experiment	
	17.6+16.5=34.1 divisions=222.6 volts
1 minute later	15.5+16.2=31.7 divisions=213.4 volts
difference in 1 minute	9.2 volts
difference in 1 hour	552.0 volts

normal loss for one hour 18.26 leaves 533.74 volts per 200 c.cm. of mineral water in one hour, for 1,000 c.cm., 2668.7 volts.

This figure must be multiplied by the factor .01277 (according to the dispersion factor of the instrument, 13.8) which gives a radioactivity of 34.0792 M-U per litre in one hour with one minute's reading.

*Results of the Tests for Radioactivity of Mountain Valley Water* are reported in the following tables and show the differences in the water from the sealed and opened bottles, from the tank water, the activity of the dry residue in the bottle and tank water.

#### EXPLANATION TO TABLES.

(1) Mountain Valley water kept one day in ice-box, then bottle opened and water determined; figures after deduction of normal loss 18.2 per 1,000 c.cm. an hour.

(2) The Mountain Valley water is radioactive but only to a very small extent; most of the emanation is given off at the beginning of the reading; the value observed after 50 min. is only 0.069 M-U per litre.

(3) Mountain Valley water left in once opened bottle, then sealed and left for twenty-four hours. The radioactivity diminishes very rapidly—after 3 minutes only alpha radiation (helium) which therapeutically is of lesser importance prevails.

(4) New sample of Mountain Valley water only 250 c.cm. tested; at a later date (new supply) normal loss for the air per hour was high, 31 volts. Rapid fall from 7.87 M-U, one minute reading, with only 0.1 M-U remaining after ten minutes' reading.

(5) Same bottle kept in closed bottle over night; the initial value is 32.3 per cent. from that noted on the previous day. Rapid decline; after 15 minutes only 0.152 M-U remain; then the alpha radiation prevails.

(6) 200 c.cm. Mountain Valley water carefully collected from a tank in which the water was shipped from the spring direct to the consumer. For the results compare figures from Table I with those recorded in item (6). Most of the emanation is given off right at the beginning, but still after 25 minutes we have per litre hour 3.09 M-U, compared with 96.38 M-U, 72 minute reading. The hour value divided by 120 gives the emanation just freed at the time of observation. For the first half minute 0.08, the first minute 1.10, for 25 minutes 0.0051 M-U are only found.

(7) Water examined from a lead tank (January, 1914); 200 c.cm. of water tested at once; the difference with the bottled water needs no further comment (about 18.6 per cent. higher in the lead tank water). Most of the emanation escapes right at the onset of the experiment.

TABLE I.

[illegible]



(8) 200 c.cm. lead tank water, collected under all precautions. Determinations made 5 minutes after collection; as a consequence, only 0.87 M-U per litre hour or about 30 per cent. loss is incurred by a transport of the water in 5 minutes.

(9) 200 c.cm. Mountain Valley water from the same shipment, but from an iron tank (galvanized), showing a smaller radioactivity, about 62.6 per cent. less. The material, or metal used for the tanks seems of technical importance. Lead which has a greater power of absorption for induced radioactivity seems preferable to galvanized iron. From a hygienic standpoint, lead, however, is questionable. The difference is also noticeable in the radioactivity of the sediment as shown in Table III—Nos. 14, 15.

(10) 200 c.cm. Mountain Valley water after boiling, showing a faint trace of radiation, slight alpha radiation at the beginning, which changes into beta radiation, the values being slightly higher than in Table II.

(11) 200 c.cm. Mountain Valley water from lead tank, boiled, filtered. Only within the first 10 minutes a slight trace of beta radiation can be detected, which changes into alpha radiation. Most of the radioactivity of the water must therefore be attributed to dissolved emanation.

(12) 100 c.cm. Mountain Valley water, boiled for 5 minutes; the gas mixture escaping was collected in the gas tank, the same technique as described in former publication (Hemmeter and Zueblin, *Arch. Int. Med.*, 1915, XV, p. 188), without any corrections as recorded on p. 193, since the radioactivity of the water is very low. After four minutes had elapsed the leaflets fell together, and the recharged instrument gave the readings given in item No. 13.

(13) Repeated test, mentioned above. It is still questionable (Engler and Sieveking) whether the computation of these figures into one litre and into Mache-units is acceptable, in which instance the simple quotation of volts of these gaseous compounds is recommended.

(14) Activity from 50 mgrm. dried precipitate from lead tank water, obtained by evaporation of 200 c.cm. of water. For the computation, a different formula must be used (Engler and Sieveking, Guenther and Tegetmeyer); in our instance it is

$$\frac{125}{\text{gram subst.}} \times \frac{\text{Volts}}{3600} \times \frac{C}{300}; \frac{125}{0.250} \times \frac{\text{Volts}}{3600} \times \frac{C}{300}; \text{"X" Volts} \times 0.00639 \text{ M-U.}$$

In this test with the dry residue contained in 1,000 c.cm. equals 0.25 gm.; the beta radiation is pronounced during the first 45 minutes; after that, alpha radiation prevails; the fall is rapid. The radioactivity of the Mountain Valley water in tanks is not only due to dissolved, but also partly due to a radioactive sediment.

(15) Iron tank water, radioactivity from 200 c.cm., sediment 0.2 gm., computation factor = volts X 0.095 M-U. Comparison with No. 14 reveals striking difference with the higher radioactive sediment from the lead tank, confirming the statements already made in No. 9.

(16) 250 c.cm. bottled Mountain Valley water, evaporated and dry residue tested, the weight of which, however, could not be ascertained. The chemical analysis of the water (R. Haywood, Analytic Consulting Chemist, Washington, D. C.) showing 352.86 parts of solid matter per one million parts of fluid; in 1,000 c.cm. of water 0.35286 parts of solid matter would result; value a little higher than ascertained in Nos. 14 and 15; factor would be = volts X 0.00452 M-U.

TABLE II.  
THE RADIOACTIVITY OF MOUNTAIN VALLEY WATER AS CONTAINED IN TANKS.

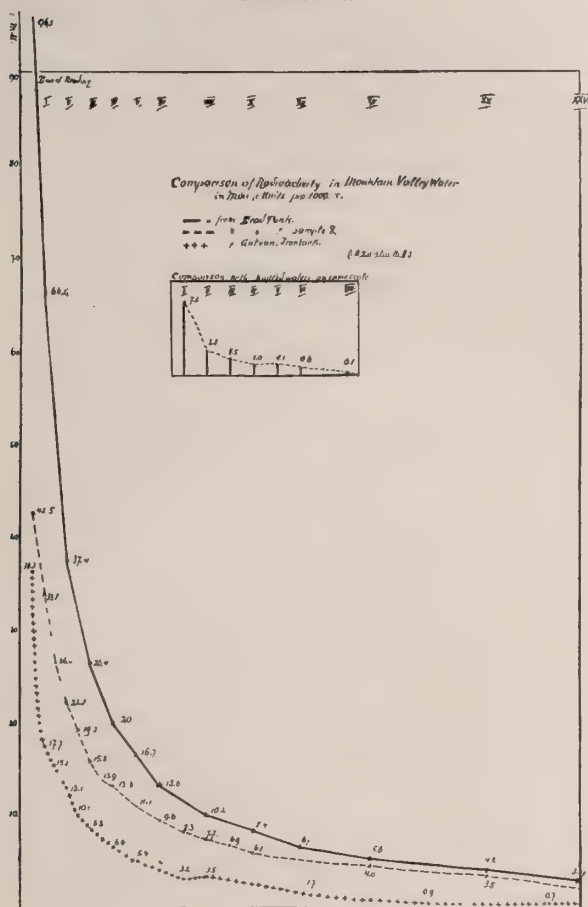
Time Min.	6.		7.		8.		9.		10.		11.	
	Volts	M-U.	Volts	M-U.	Volts	M-U.	Volts	M-U.	Volts	M-U.	Volts	M-U.
$\frac{1}{2}$	7589.0	96.38	3448.7	42.53	2004.7	25.45	2855.0	36.26				
1	5214.0	66.21	2668.7	33.89	1759.7	22.34	1395.0	17.72				
$1\frac{1}{2}$	3544.0	45.01	2083.2	26.46	1299.7	16.51	1195.0	15.18				
2	2949.0	37.45	1798.7	22.84	1084.7	13.78	1025.0	13.02	37.5	0.47a		
$2\frac{1}{2}$			1518.7	19.29	955.7	12.14	790.0	10.03				
3	2084.0	26.46	1248.7	15.86	808.2	10.26	695.0	8.83	32.5	0.41b		
$3\frac{1}{2}$	1087.0	22.95	1098.7	13.95								
4	1576.5	20.01	1048.7	13.33	694.7	8.82	522.5	6.63	30.0	0.38b		
5	1320.0	16.76	874.7	11.08	559.9	7.0	425.0	5.39	34.5	0.44b		
6	1074.0	13.64	758.7	9.64	514.7	6.53	330.0	4.19				
7			653.7	8.30			256.0	3.25				
8	807.7	10.26	608.7	7.73	394.7	5.01	275.5	3.50				
9			547.7	6.16								
10	660.0	8.46	484.7	6.15	295.7	3.74	135.5	1.72	118.5	1.58b	38.0	0.48b.
12	529.0	6.71										
15	438.0	5.56	381.7	4.05	199.7	2.54			102.5	1.30b		
20	330.0	4.22	276.2	3.51	141.2	1.79			76.5	0.97b	17.5	0.22a.
25	243.5	3.09					56.0	0.71 (22.½')	61.5	0.78b		
30			171.7	2.18	99.7	1.17			52.5	0.66b	5.0	0.06a.
60			107.7	1.37	69.2	0.88					7.0	0.09a.

TABLE III.  
EXPLANATION TO TABLE.

Time Min.	12.		13.		14.		15.		16.	
	Volts	M-U.	Volts	M-U.	Volts	M-U.	Volts	M-U.	Volts	M-U.
1	628.0	80.19		$\frac{1}{2}'$	271.0	1.73			326.4	1.47
2	418.0	53.37	118.0	15.07	61.1	0.39	8.5	0.81a	230.4	1.04
3	348.0	44.43	128.0	16.34	121.0	0.77	1.5	0.14b	166.4	0.75
4	358.0	45.72	208.0	26.56	101.0	0.65	1.85	0.17a	128.4	0.58
5			124.0	15.83	91.0	0.58	0.2	0.02b	86.4	0.39
10			22.0	2.81	85.0	0.54	3.0	0.03a	24.0	0.11
13					45.0	0.29			3.2	0.01
15			80.0	10.22		0.09			13.2	0.06
18					14.5					
20										
23										
28					16.5	0.30				
30					32.0	0.20			13.6	0.06
33										
35					20.0	0.13				
40					22.5	0.14				
45					11.0	0.07				
51					8.5	0.05				
55					5.0	0.03a				
60					0.5	0.003a				
65					2.5	0.016a				
					10.0	0.06a				



## CHART I.



EXPLANATION TO CURVES:—

Comparison of radioactivity of Mountain Valley water expressed in Mache-units per one hour and 1,000 c.cm. of mineral water.

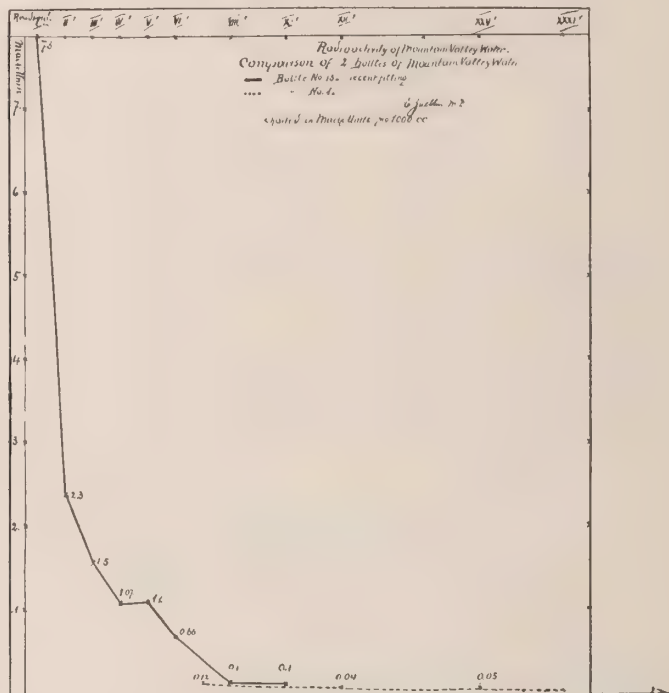
- Curve of water from lead tank.  
 - - - Curve of water from lead tank No. 2.  
 + + + + Curve of water from galvanized iron tank.

Smaller chart shows on same scale the radioactivity of bottled Mountain Valley water.

Time forbids to enter into more details of these radioactive determinations, but as a summary it can be said that Mountain Valley water contained in sealed bottles is far from representing a uniform radioactivity. Even if vender and consumer of the water observe the greatest care in the handling of the water, it cannot be presumed that the patient in drinking the water would absorb the maximum number of Mache-units, so in individual cases the patient probably gets a smaller percentage of M-U than found with a maxi-

mum on one minute's reading. By standing, even in a closed bottle, the water loses its strength constantly (not only that the beta radiation may be weaker, 365 volts or 4.64 M-U less, but also only alpha rays can be found); even up to 90 and more per cent. may be so lost. Van Noorden's standard for therapeutically active mineral waters requires 20-25 M-U for the weak, 50-100 M-U for the medium, and for the strong radioactive waters over 100 M-U

CHART II.



## EXPLANATION TO CURVES:—

Radioactivity of bottled Mountain Valley water.

- Water of recent filling test No. 4.  
- - - - - Water of less recent filling test No. 1.

(Zueblin, *Maryland Jour. Med.*, 1914, LVII, p. 112; Hemmeter and Zueblin, *loc. cit.*). In accepting such a standard, Mountain Valley water contained in sealed bottles ranges below the first category of radioactive products on sale. The patient in the average instance would not consume 1,000 c.cm. of water at once; with one dose probably smaller amounts of emanation are introduced.

Mountain Valley water, examined from the tanks, gives no constant radioactivity. This depends upon various factors, even careful technique being strictly observed, the material of which the tank is made is important, lead being better for the prevention of the con-

stant escape of rays. The tests recorded under Nos. 7, 8 and 9, from tanks that had been filled five weeks previous to the determination of the radioactivity, promise the consumer a higher medium strong radioactive water, which must be preferred to the bottled specimens. Also in this shipment, as seen from Nos. 7 and 8, the loss of emanation is rapid, unavoidable, even in taking all the precautions recommended.

The radioactivity of the Mountain Valley water in sealed bottles, but much more so from the tanks, is partly due to dissolved emanation; partly, though not considerably so, due to a radioactive sediment. The strength of activity again depends upon the material of the tank; lead compositions permit the finding of higher activity than galvanized iron. This statement, however, does not include any assertion that lead might be chemically changed and so pollute the water and mean an inconvenience for the patient.

In the present investigation the radioactivity of Mountain Valley water has only been investigated, as examined from bottle and tank water. Dr. C. Glaser, analytic chemist at Baltimore, who made tests also with tank water, quotes with thirty minutes' observation per one litre hour 1.22 M-U; with sixty minutes' observation only 0.94 M-U for the same amount of fluid.

A comparison of the radioactivity of bottled Mountain Valley water, with the high radioactivity of springs from this and foreign countries, is out of the question as of theoretical and financial interest; the therapeutic utility of the water can only be approached by the clinical and close observation of various patients, which subject will be discussed from the standpoint of clinical facts.



## THE USE OF THE X-RAY IN THE TREATMENT OF SUPERFICIAL AND DEEP LESIONS.\*

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By FRED B. HALL, M. D., of St. Louis.

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The selective influence of the roentgen ray upon abnormal cellular structure has long been known and is probably best explained by its lessened resistance due to its rapid and incomplete development, and its early partial or complete destruction from mode of growth.

The use of the roentgen ray as a therapeutic agent fell into disrepute on account of the untoward results upon normal cells at the hands both of experienced and inexperienced users of this valuable aid in the treatment of benign and malignant growths.

This naturally and fortunately led to the abandonment of its use practically by all physicians who applied it in the routine of general practice.

Fortunately, again, it spurred the roentgenologist on to a scientific search for the cause of danger and to the perfection of a technique that has, to a great extent, eliminated this danger to-day.

The physical property of the *x*-ray is known to be of a varying degree of hardness and its effect upon cellular structure is due to and dependent upon this.

The terms alpha, beta and gamma indicate the force of emanation of the ray and, therefore, its penetrability through media exposed to its passage.

The alpha, or softest ray, probably does not get beyond the thin glass of the *x*-ray tube. The beta, or ray of next degree of hardness, is the first to be considered effective as a therapeutic agent, and must be guarded against as a source of danger.

The gamma, or hardest ray, is the one used in deep therapy after filtering out the softer beta ray.

The next step in the progress of perfecting the technique was to find a means of measuring these qualities of the ray and the amount the normal skin could stand. The first essential is fairly well indicated by the reading of the milliammeter and by observing the distance backed up by the spark gap between the terminals before the stepped-up voltage passes through the vacuum of the tube. A low reading on the milliammeter and a long spark gap indicate a hard tube, one of high vacuum, and, therefore, more penetration.

The measure of endurance of the normal skin is best made by registering the chemical effect of the ray upon sensitized bromide

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\*On account of lack of space this article was omitted from the Special Cancer Number (July).

paper, or upon the pastille of platinum-barium-cyanide. The former necessitates the development of the paper by a very painstaking process, but possibly is more accurate on this account. Its shade, when developed, is measured on a scale of shades of its color numbered from 1 to 10, denoting the effect upon the skin, and the maximum, or 10, represents the erythema or skin dose. This dose, or 10X, has become the standard of measurement.

The pastille is measured in the same way. It changes its color under the action of the ray, and is likewise measured on a scale of shades of its color.

The difficulty of maintaining a constant vacuum in a given tube was hard to overcome. As first made, it soon became very hot while in use, and of such low vacuum, as a result of this heat, that a number of tubes, used one after the other, were necessary to obtain the full dose. Then the water-cooled tube was perfected. In this a volume of water in a large bulb rests against the target of the tube, absorbs and disseminates the heat as it is generated. This is rendered more effectual by a device that keeps the water constantly changed and, therefore, cooler for a longer time.

It is finally due to the investigations of Coolidge, in the experimental laboratories of the General Electric Company, at Schenectady, N. Y., that we are indebted for what is probably the most important step in the whole field of roentgenology since Roentgen himself made his first observations.

This is the tube that bears Coolidge's name. Its efficiency is due to its enormously high vacuum and to the fact that this remains constant and is easily regulated for an indefinite time.

The transformer type of machine, as now universally used, makes it possible to deliver, through this tube, a maximum amount of ray that was before impossible.

The types of lesions treated by the *x*-ray are divided into the superficial and deep. The latter include all covered with normal skin and those on the skin that extend deeper than the epithelial cells.

In treating all these, the effect of the ray on the normal cells and the depth to which the rays must penetrate are the two essential points. The harmful effects on the normal skin are overcome by filtering out the softer rays and by careful measurement on the pastille. Aluminum in varying degrees of thickness is the most universally used medium for stopping the softer rays. From 1 mm. to 5 mm., according to the case in hand, are the thicknesses used.

All metals while under the action of the *x*-ray give off secondary rays that are harmful to the skin. Protection from these is afforded by placing a thin layer of leather between the metal and the skin, the leather absorbing these secondary rays.

The length of time it takes to administer the erythema dose de-

depends on the quality of the ray, the distance of the target from the patient, and the thickness of the aluminum filter. Without the filter, a soft ray, with the target near the skin, will produce the erythema dose in half a minute or less.

In treating deep-seated lesions, a hard tube measuring 5 milliamperes backing up a seven-inch spark gap and filtered through 4 mm. of aluminum usually gives the required dosage in five minutes.



Fig. 1.



Fig. 2.

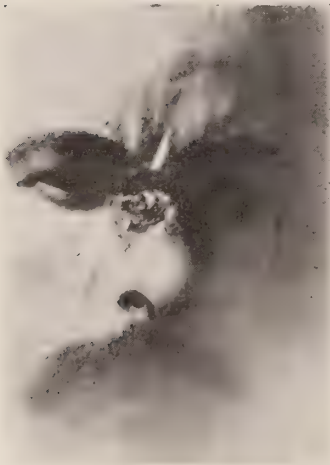


Fig. 3.



Fig. 4.

If the entire area of a given mass is exposed at once, this would be all that could be directed on the skin covering it.

This led to the system of cross-fire treatment, by which is meant subdividing the skin into a number of areas, usually four or six, and numbering them. All but No. 1 are covered with lead, and the mass through area No. 1, as a port of entry, is given the full dosage.

For safety, so that this area will not get a second exposure, it is marked as having been treated. Each succeeding area is thus



treated. In this way the mass below the surface receives six times the amount of *x*-ray that could have been given with one exposure.

Normally, a skin reaction will take place with this method, and to give time for this to return to normal, a period of three weeks must elapse before a second series of treatment is given.

In the treatment of superficial lesions one application will often cause their disappearance.

The following are the records of cases treated in private practice and at the Barnard Free Skin and Cancer Hospital, St. Louis:—

CASE I.—Epithelioma of the temple of seven years' standing. One erythema dose, or 10X, as registered on the pastille was given. This was unfiltered and resulted in a slight reaction. In six weeks the condition shown in Fig. 2 was obtained.

CASE II.—Epithelioma of the nose of many years' standing. Fig. 3 shows the condition existing when the first treatment was given. Four erythema doses were given at three weeks' interval, resulting, as shown, in a soft epithelial covering (Fig. 4).

CASE III.—Mr. B. referred by Dr. W. A. Hardaway, of St. Louis. Epithelioma of the inner canthus of eye of twenty-five years' duration.

After two 15X doses with the Coolidge tube at an interval of three weeks, the lesion completely healed.

CASE IV.—Mr. C., *æt.* fifty-seven, referred by Dr. Robt. Schlueter, of St. Louis. Operated upon in December, 1913, for gall-stones. Prompt recovery. In six months a small mass was noticed on the scar line.

In December, 1914, an exploratory operation was made and carcinoma of gall-bladder and liver was diagnosed. When seen by me on April 13th, 1915, a mass the size of an orange extended above the surface of the skin. This was bleeding constantly and, at short intervals, extensive hemorrhages threatened the life of the patient. This mass was treated on the above date through four ports of entry, giving 15X to each area, or a total of 60X.

The hemorrhage was completely controlled by the first treatments.

In three weeks the mass was much reduced in size. A second series of treatments were then given. The mass rapidly disappeared and, when seen three weeks after the second treatment, had entirely disappeared, leaving a depressed area about 1 in. in diameter.

The patient has gained 10 lb. in weight; has returned to his work, and walks two miles a day to his work.

The liver dullness is reduced almost to normal.

## SUBFASCIAL LIPOMA MISTAKEN FOR SARCOMA.

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By HOWARD LILIENTHAL, M. D., F. A. C. S., of New York,  
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There are few surgical conditions easier to recognize than the usual form of subcutaneous lipoma. The history, the slow growth, the painlessness, lobulation, the mobility and the region occupied by the growth are usually sufficiently characteristic to save the surgeon from embarrassment. Occasionally a cold abscess or a soft cyst may cause confusion, but the diagnosis is usually cleared up after a short period of observation. There is one form of lipoma, however, which has in 2 cases caused me and my patient much anxiety and in one case unnecessary treatment and loss of time.

In each instance the tumor was located beneath tense fascia which completely masked the lobulation and the peculiar soft feel of fatty tissue substituting therefor the tense elasticity of a connective-tissue tumor. Just as the soft, easily compressible, inflated inner tube of a tire takes on the solid though springy qualities, so well known when this same tire is confined in a casing, the soft, doughy lipoma is converted by its fascial covering into a firm, resistant body.

CASE I.—Mrs. M., *æt.* forty-seven, was admitted to Mt. Sinai Hospital on December 27th, 1911. The past history of the patient threw no light upon the case. For about three years she had noted a swelling in the upper outer anterior part of the left thigh and the mass had gradually increased in size. There had never been pain and there was no constitutional disturbance nor loss of weight.

On examination a tumor the size of a small grape-fruit was found apparently connected with the iliotibial band of the fascia lata, tense and elastic on palpation and movable from side to side with the fascia. It was thought to be a typical sarcoma of the fascia lata and the prognosis was therefore grave. The case appeared quite inoperable and treatment with Coley's mixed toxins of erysipelas and prodigiosus was instituted. Following the injections there was considerable reaction with temperature as high as 105° F. and the tumor became reddened, the tissues about it indurated and the skin adherent to the tumor. For four months this treatment was continued, the patient losing considerable weight. The injections were then omitted and there followed a marked diminution in the size of the growth. For a few weeks under the influence of sodium arsenite in solution, hypodermically administered, the weight increased and the general condition rapidly improved. The tumor became softer, and early in May, 1912, increased mobility and a more healthy appearance of the entire region made me believe that extirpation might now be safely performed.

Accordingly, on May 6th, 1912, in ether anesthesia, the tumor was extirpated and to my chagrin was found to be a large lipoma lying between the

sartorius and quadriceps extensor femoris muscles. Prompt recovery followed the extirpation and the patient went home well after about five months of hospital residence.

During her stay in the institution she was repeatedly examined and observed by the members of the Second Surgical Service, and not even a suggestion was made that the tumor was anything other than a sarcoma. Indeed, I feared the probable dissemination incident to the removal of a specimen for examination from a tumor so characteristically malignant!

CASE II.—Mrs. L., *æt.* forty-five, came to me complaining of pain in the right sacro-iliac region, shooting down the back of the thigh. A number of years before it had been necessary to perform hysterectomy for a fibroid. The pain of which she complained had been noted for a few weeks only, and the patient being of a neurotic and timid type would surely have come for advice earlier had the symptoms been present.

On careful examination a firm elastic mass the size of a small English walnut was found apparently underneath the gluteus maximus muscle. Pressure here exaggerated the radiating pain of which the patient complained.

The diagnosis of a solid tumor was made, although the possibility of a cyst could not be excluded and the patient entered the Private Pavilion of Mt. Sinai Hospital where, in ether anesthesia, an incision was made parallel to the fibres of the gluteus maximus. With good retraction the fascia covering the gluteus medius was exposed at the location of the tumor, and on incising this fascia out popped a perfectly innocent lipoma which had been held under tension by the pressure of the gluteus medius fascia. The wound was sutured and recovery with complete relief of the pain followed.

I had feared sarcoma because of the rather sudden appearance of a solid tumor and I had given a guarded prognosis to the patient's husband.

The question of treatment in supposedly inoperable deep tumors is an important one. If malignancy can with certainty be diagnosed we have the alternative of an incomplete removal with perhaps the temporary relief of symptoms and—too frequently—the shortening of life; or treatment by toxins, by radiotherapy or by drugs. Then, too, there is the obsolescent 'expectant treatment' which sometimes is as good as any other, since the spontaneous disappearance of malignant growths is not an absolute impossibility.

If the tumor is of doubtful pathology but clearly inoperable, the time which may be properly spent in making an accurate diagnosis will depend upon the rapidity with which dangerous progress occurs. For example, the nature of a tumor of the skull which is producing intracranial pressure should be cleared up with greater celerity than that of a slow growing mass in the muscles of the upper thigh. We have, therefore, a fair excuse for the unfortunate delay in my Case I. I have more than once marked with concern the rapid extension of an inoperable malignant growth which had been cut to secure a specimen.

If the experiences recounted here teach anything, they show that malignant growths may be simulated by benign ones.



## CASES OF HEREDITARY TENDENCY TO GASTRIC ULCER.\*

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We are not aware of all the factors entering into the causation of ulcer of the stomach and duodenum. We think that we understand the actual formation of the ulcer as explained by a small infarct of a terminal vessel, with which certain bacteria are probably connected, and the digestion of the ensuing necrotic area by the gastric juice, either hyperacid at the time or shortly becoming so. But we are decidedly ignorant of the factors which predispose some people to the production of ulcer.

I am reporting herewith two instances of what I have called 'ulcer families' to show that the tendency to develop ulcer may be transmitted by heredity. The first consists of a mother and three children.

Mrs. W. P. F., *æt.* sixty, had six children. She was seen by me for the first time, December 12th, 1913. She had suffered with attacks of pain in the stomach for at least twelve years. Examination of the stomach contents showed hyperacidity. There was a tender point which, under the fluoroscope, was found to be on the lesser curvature near the pylorus. Occult blood was present in the stool and there was a positive thread test. Radiographic examination also showed a marked colonic ptosis with reduplication and fixation of the hepatic flexure and transverse colon. She improved under medical treatment.

Her son, A. F., *æt.* twenty-one, sent for me December 21st, 1913. He had had indigestion for a couple of months, his pain starting two hours after meals. Five days before, he had suddenly been seized with agonizing cramps and had been taken to a hospital. After careful examination he was found to have a chronic perforation of a duodenal ulcer with the formation of an abscess cavity. Diagnosis was confirmed by operation.

A second son, R. F., *æt.* thirty-one, consulted me in June, 1914, with symptoms of fifteen years' duration. He had typical symptoms of duodenal ulcer, tender point, positive thread test and occult blood. Operation revealed a large saddle ulcer, nearly completely encircling the duodenum and extending up to the pylorus. It looked in one place as if about to perforate.

On July 16th, 1914, a daughter, S. F., *æt.* twenty, consulted me. Her symptoms were of two years' duration, with pain in the stomach immediately after meals. Operation revealed a small ulcer on the greater curvature near the pylorus. She later developed a return of symptoms, and radiographic examination showed a constant irregular defect high up on the lesser curvature, suggesting a growth. There were pain and tenderness over this spot. She was relieved by medical means and I believe there was a second ulcer at this point.

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\*Read before the Hippocrates Society, Washington, D. C., April 8th, 1915.

We have, therefore, the quite remarkable history of a mother and three children with ulcer, all of the latter being proved. True, the mother apparently did not develop her ulcer until after the birth of the children, but she must have had some predisposition to the trouble which was transmitted to the children who, by the way, are the three children who most resemble each other and their mother. I have carefully inquired into their mode of living and can find nothing in this respect which would tend to produce the lesion.

The second family consists of a mother and her two daughters. Both daughters have been patients of mine, but the mother died in Germany some years ago. The cause of the mother's death seems, from a consideration of the history given me by her daughters, to have been undoubtedly carcinoma developed on an ulcer of some years' standing.

The oldest daughter, Mrs. A. O., *æt.* thirty-six, was first seen by me December 11th, 1913. She had had trouble with her stomach from childhood. A consideration of her symptoms and examination led to the diagnosis of gastric ulcer with hour-glass deformity. Operation revealed a large, indurated ulcer on the lesser curvature with almost complete hour-glass and a sealed-up perforation.

Her sister Miss E. O., *æt.* twenty-seven, consulted me in March, 1914, with a history of two years' duration. She had pain just below the xyphoid, nausea, vomiting and headache. There was a localized tender point, occult blood in the stool, positive thread test, incisura under the x-ray and a six-hour residue. All these enabled me to make a positive diagnosis of ulcer of the lesser curvature. She was relieved by bed treatment.

In this last family each member lived in a different house and there was no factor discoverable which could have accounted for the mother and her only two children having ulcer.

During the last couple of days there has come to my attention another instance of ulcer family, in the practice of one of my confrères, in which there were 3 ulcer cases complicated by hemorrhages.

The Rochambeau.

## PNEUMOTHORAX PUNCTURE SITES.

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By EDWARD VON ADELUNG, M. D., of Oakland, Cal.

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In operating to induce therapeutic pneumothorax, the principal obstruction encountered is adherent pleura. It presents a mechanical barrier to the introduction of gas into the pleural sac that is nearly always prohibitory. It is therefore very desirable to be able to foretell the presence of this obstruction, if possible, so that the operation may not be attempted at a site that will render it futile.

The means by which we attempt the diagnosis of the existence or absence of pleural adhesion are inspection, palpation, percussion, auscultation, radiogram, and Little's sign. The history of pleuritic pain may give a suggestion; so also retraction of the thoracic wall during respiration suggests local adhesion. But neither inspection, palpation, percussion, auscultation, nor the radiogram can be relied on for positive information of pleural adhesions. Little's sign may be of some value, but only in the limited region where the shadow is ordinarily seen. The best clinicians feel that it is true that as yet pleural adhesion cannot be positively diagnosed. This being admitted, we are obliged to depend on probabilities. In this sense the dead-house findings offer some help.

According to the Second and Third Annual Reports of the Henry Phipps Institute, where 143 tuberculosis autopsies were examined in this respect, total obliteration of the pleural space occurred in about 18 per cent. "In 143 autopsies there were only 10 normal pleuræ, 5 on each side. In *no* case were both pleuræ normal. The right apex is normal less frequently than the left (19.3 per cent. against 10.5 per cent.), while the remainder of the two lungs practically correspond."

At the apex the adhesions are more likely to be posterior than anterior (14 per cent. against 9 per cent.), especially in the right apex where the adhesions are situated *posteriorly six times as frequently as anteriorly*. It is, however, well known that adhesions may occur anywhere, and are usually distributed in irregular areas leaving other areas free, some at the base and some about the upper lobes, so that it is not surprising that at times when an entry cannot be found in the lower thorax the inflation is possible in higher sites. It is evident from post-mortem findings that operation is more likely to be possible in the anterior first and second interspaces than posteriorly; hence the importance of the supra-



nipple anterior area. The writer has noticed that operators seem to fear to make the Forlanini puncture above the nipple level anteriorly. Some write of having done it, but mention it apologetically. Nevertheless, it is a fact that in quite a number of cases where adhesions render pneumothorax impossible in the 'safer' areas (by which the writer means the lower thorax, beneath the nipple level, and the axillæ), it will be found quite easy to get gas into the pleural sac above the nipple level. The danger of injuring large blood-vessels is slight if one uses common sense. Even in the first space, if one keeps away from the sternal border one inch, and does not pass the needle through the thickness of the lung, operation in the interspaces above the nipple level is not only safe but desirable in many cases. It should always be tried before a case is pronounced inoperable on account of adhesions. In this area, too, it will be found that a small pneumothorax will give better results than elsewhere, because it is here that the oldest and sometimes the only lung lesions are found. The thorax being smaller here, a small amount of gas produces a proportionately larger pressure.

In the writer's opinion no one should begin pneumothorax work on human beings until he has done enough on the dog to be very familiar with his apparatus. And he should also refresh his memory regarding the anatomy of the pleura and the mediastinal organs. Unless he be thus prepared, he is not warranted in inflating the pleura of man—certainly he is not warranted in making punctures near the sternum or near the clavicle.

The following cases illustrate the harmlessness of supra-nipple punctures:—

Case I.—Forty punctures in second space.

Case II.—Ten punctures in second space.

Case III.—Ten punctures in second space.

Case IV.—Six punctures in second and third spaces.

Case V.—Four punctures in second and third spaces.

Case VI.—Six punctures in second and third spaces.

Cases VII and VIII.—Two punctures in third space and ten in area beneath the scapula.

In over 77 supra-nipple punctures, the writer has never encountered the least suggestion of injury to important blood-vessels or other organs. He is careful to use a short needle, to introduce it slowly, avoiding deep punctures as useless and dangerous. Puncturing far beyond the depth where the pleura lies, is the most common mistake of beginners. To search beyond the thickness of the thorax wall for a pleural sac is indefensible.

# MEDICAL AND SURGICAL PROGRESS.

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## THE ANEMIAS OF INFANCY AND CHILDHOOD.

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### A REVIEW OF RECENT LITERATURE.

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By ALFRED FRIEDLANDER, M. D., of the Editorial Staff.

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1. Lövegren (*Archiv fuer Kinderheilk.*, 1914, Vol. XXIX, Hft. 6).
2. Balard (*Bull. de la Soc. d'obst. et de Gyn. de Paris*, June, 1914).
3. Lespinasse (*Jour. Amer. Med. Assoc.*, June 13th, 1914).
4. Stamm (*Der Kinderarzt*, 1914, Vol. XXV, p. 145).
5. Hymanson (*Amer. Jour. Obstet.*, April, 1915, p. 698).
6. Green (*Boston Med. and Surg. Jour.*, 1914, Vol. CLXXI, p. 715).
7. Peterson (*Amer. Jour. Obstet.*, February, 1915, p. 358).
8. Bodenheimer (*New York State Med. Jour.*, October 10th, 1914).
9. Stettner (*Jahrbuch fuer Kinderheilk.*, November, 1914, Vol. 80).
10. Morse and Wyman (*Amer. Jour. Dis. Chil.*, October, 1914).
11. Cristina (*La Pediatria*, 1913, Vol. XXI, p. 748).
12. Hess and Fish (*Amer. Jour. Dis. Chil.*, December, 1914).

Discussing the pathogenesis of *melena neonatorum*, Lövegren says that in all probability the main cause of this disease is to be found in disturbance of function of the blood organs. To support this theory, the author cites the anatomopathologic changes found by him in the blood, and reports the results of his clinical observations. Balard, on the other hand, thinks that gastro-intestinal hemorrhages in the newly born may be divided, as to causation, into the infectious and mechanical. The mechanical almost always result from disturbances of circulation, combined with difficult respiration, causing a sudden hypotension, especially in the abdominal organs. There is a reflux toward the umbilical vein, which explains the frequency of hemorrhage there. If the ligature is strong, this wave is thrown back upon the abdominal organs, and produces intense passive congestion.

As a result of severe infections there is a grave change in the blood formula of the newly born, with failure of the blood to coagulate. Mechanical hemorrhages occur early and isolated, and the prognosis is good. Infectious hemorrhages appear late, are multiple, treatment is of no avail, and the prognosis is always grave.

Lespinasse says that the causes of the condition are syphilis, infection, hypoplasia of the coagulating elements of the blood and asphyxia. The pathologic findings are usually negative, except for the bleeding, although in a few cases the lesions of syphilis are found, or there may be a positive blood culture. The onset in the general run of cases is from the second to the fifth day. Contrary to Balard, Lespinasse holds that the earlier the onset, the graver the prognosis. In luetic cases, the onset may be delayed to the seventh or even the ninth day.

Stamm records 5 cases, 4 of whom were males. In 4, birth was normal; one was a forceps case. The melena began on the first, second, third (2 cases) and fourth days respectively. Hematemesis occurred in only one case. The forceps case died on the third day after birth, following an enormous intestinal hemorrhage on the second day. The other four cases recovered. The melena lasted two to three days. The autopsy of the fatal case showed anemia of all the organs, subpleural and subdural ecchymoses, and an ulcer 0.5 cm. long in the mucosa, 1 cm. below the pylorus. So far as treatment is concerned, all of Stamm's cases were treated with gelatine by mouth, in rectal injections, and subcutaneously. Recently much attention has been given to the treatment of melena, by means of fresh normal serum, either human or horse. Early in January, 1915, Hymanson reported, before the New York Academy of Medicine, 4 cases of melena treated by horse serum. He referred to the favorable reports concerning the use of gelatine and calcium, though it is well known that there is no lack of calcium in melena. He also referred to remarkable cures effected by transfusion (see below). Serum is easily obtained and very effective. Fresh animal serum, just as human serum, contains all the ferments of the blood; it acts by its nutritive and bactericidal power, and it also favors coagulation.

Hymanson believes that serum should be used freely, early, and if necessary repeatedly, in melena. (His average doses were 15 c.cm. of normal horse serum.) He believes that the danger of anaphylactic reaction is not at all great. In a discussion which followed, the value of fresh horse serum was generally conceded, though it was pointed out that if suitable human serum could be obtained (*i. e.*, one that could not cause hemolysis) it would probably be more certain in its action than animal serum.

Lövegren is convinced of the value of subcutaneous injections of gelatine, though he too has seen excellent results from direct transfusion.

Lespinasse is a firm believer in direct blood transfusion in these cases. Of his 14 personal cases, on all of which transfusion was done, none died of hemorrhage. Two died of syphilis. He prefers the femoral vein, as offering the least technical difficulty. To the 37 cases all told, collected by Lespinasse, Green adds 4 cases. The four deaths in this series of 41 cases represent a mortality of 10 per cent. As the mortality under older methods of treatment has been at least 50 per cent., this in itself seems sufficient evidence, according to Green, for the value of transfusion. A probable further reduction of mortality in the future may be expected from its more prompt and universal application. Green feels that the best technique is that as devised by Kimpton. He adds that the



greatest need of investigation in this field at present is the relation of hemorrhagic disease of the newborn to syphilis.

Various observers have, however, pointed out the fact that blood transfusion in the newborn is technically very difficult, that it is hard to get suitable blood, that much valuable time may be lost in necessary preliminary tests, and that the results from the use of *fresh* normal animal serum are so good and the procedure is so simple that they feel convinced of the advisability of using the serum. With this view, the author of this abstract is in hearty accord, as the result of a somewhat extended experience.

At another meeting of the New York Academy of Medicine, Peterson read a paper on the effect of blood transfusion in certain hemorrhagic conditions in childhood. He reported cases of purpura hemorrhagica, secondary anemia following injury, Henoch's purpura, and chronic sepsis following pneumonia and empyema. In all these cases, direct transfusion was done, the mother being the donor in 3 of the cases, the father in the other. In each instance preliminary test proved satisfactory. In all of the cases, the results were very good. The children were respectively four and a half, one and a half, eleven, and two and a half years of age. In the discussion, Hess called attention to the value of defibrinating the patient's own blood and reinjecting it. This method has the value of being highly practical. No hemolytic tests are required, no donor, and there is no difficult technique.

Bodenheimer reports a case of purpura hemorrhagica treated by calcium lactate and gelatine, without much benefit. The case yielded promptly to injections of horse serum given intramuscularly. Two injections only were required.

In an article on the severe anemias of childhood (based upon clinical study as well as on a review of the literature), Stettner comes to the following conclusions. As the result of diverse causes children fall prey to very severe anemias. This is particularly true following acute infections. The anemia is caused by greatly increased blood destruction. Regeneration processes in the hemopoietic organs set in with an energy which is directly measurable by the general condition and constitutional stability of the child. Intercurrent infections in the child are normally met by increased activity of the hemopoietic organs. If the infection be very severe (or the resistance insufficient), there is a lack of leucocytosis and a diminution of the neutrophilic content. On account of the physiologic diminution in neutrophiles as normally seen in the first years of life, it often happens that there is an irritation leucocytosis, with an absolute lymphocytosis. This occurrence of lymphocytosis is particularly favored by lowered constitutional resistance.

The blood of infants during infection shows certain characteristic cells—azurophilic leukoblasts. They occur at all periods of childhood during infectious processes, and are particularly numerous in the severe anemias which accompany or follow severe infections in childhood. The severest grades of anemia in childhood are capable of complete return to the normal blood picture. But during convalescence from these severe anemias, the slight resistance of the organism to intercurrent affections is particularly noteworthy.

Morse and Wyman have undertaken a series of observations with reference to the blood-pressure in anemia in infancy. In fifty normal babies under two years of age, the average systolic pressure was

90 mm., the average diastolic 60 mm., and the average pulse-pressure 25 mm. Observations were then taken on twenty-five poorly nourished babies. The systolic pressure averaged about the same, but the diastolic was lower and the pulse-pressure thus higher. Anemic babies showed a higher systolic than either the normal or poorly nourished babies, but the diastolic pressure was much lower than in either of the other classes, and the pulse-pressure thus higher. The authors are unwilling to draw any conclusions from their observations.

#### ETIOLOGY AND PATHOLOGY OF SPLENIC ANEMIA.

Cristina reports details of 12 cases in which he investigated the relation of syphilis and tuberculosis. He believes that syphilis is the predominant factor in the pathology of infantile splenic anemia, acting either directly (in most cases) or indirectly as cause of congenital dystrophy. Tuberculosis is met with in a fair proportion of cases associated with syphilis. It contributes to the irritation of the hemopoietic organs. In a limited number of cases it alone may cause splenic anemia. The pathogenic mechanism is not quite clear as yet. It is probable that there occurs a condition of chronic intoxication of the tissues concerned in the hemopoietic organs.

Hess and Fish have made a study of infantile scurvy, with special reference to the blood, the blood-vessels and the diet. The main effort of the authors concerns the blood in scurvy. As is well known, scurvy is considered a hemorrhagic disease by some authors. A summary of the results of the investigation follows. The blood plasma of scorbutic patients showed a slight diminution in clotting power. This defect did not seem, however, to be the result of an insufficiency of calcium. The antithrombin was not increased. Small amounts of blood were also obtained by puncture of the finger. Examination of this blood revealed a normal number of blood platelets. In other respects the picture was that of a simple secondary anemia, except that the hemoglobin was diminished out of proportion to the red cells. A marked regeneration of these cells during convalescence, leading to a polycythemia, was also noticed.

These various departures from the normal are insufficient to account for the hemorrhages associated with the disease. It was found by experiment that the blood-vessels of scorbutics gave way under a pressure (of a blood-pressure band) which the vessel walls of normal infants would withstand. While the authors do not claim that the test is specific for scurvy, it is a method of demonstrating weakness of vessel walls.

As a symptom of scurvy in its early incipency, the authors call attention to the presence of petechial hemorrhages of the skin and mucous membranes in many cases.

## ANAPHYLAXIS.

## A REVIEW OF RECENT LITERATURE.

By RALPH L. THOMPSON, M. D., of the Editorial Staff, and  
A. M. ALDEN, A. M., M. D., of St. Louis.

1. Coca (*Zeitschr. fuer Immunitätsforsch.*, 1914, XX, 6.)
2. Dale (*Jour. Phar. and Exp. Ther.*, 1913, IV, 167).
3. Doerr and Pick (*Zeitschr. fuer Immunitätsforsch.*, 1914, XXX, 317).
4. Fenyvessy and Freud (*Ibid.*, 1914, XXI, 59).
5. Friedberger (*Ibid.*, 1911, IX, 369).
6. Friedman (*Ibid.*, 1909, II, 591).
7. Weil (*Jour. Med. Research*, 1913, XXVII, 497).
8. Weil (*Ibid.*, 1914, XX, 317).
9. Weil (*Ibid.*, 1914, XXX, 87).
10. Weil (*Ibid.*, 1915, XXII, 107).
11. Rosenau (*Jour. Infect. Dis.*, 1911, IX, 190).
12. Richet (Anaphylaxis, Trans. by Blight, 1913, 147).
13. Gurd (*Amer. Jour. Trop. Dis. and Preventive Med.*, 1914, I, 776).
14. Gurd (*Jour. Med. Research*, 1914, XXI, 205).
15. Zinsser: Infection and Resistance. 1914.

There is perhaps at the present time no subject in the field of medical research that is attracting the attention of so many workers as anaphylaxis. Nor is there any subject, the work upon which is contributing more to our store of information concerning immunity and its interrelated conditions—infection and resistance. Until recent years, investigators working upon this subject have labored largely in the dark, knowing only that this thing which Richet called anaphylaxis was the antithesis of immunity, and that here, as Besredka remarked, the rules of immunity were “standing on their heads.” Also until very recently most observers have been trying to make the facts learned about this very interesting phenomenon fit in with the generally accepted theories regarding the mechanism of immunity. This correlation has not been altogether successful and it appears probable that in the light of the accumulating data, we are going to be compelled to revise, in part at least, our modern conception of what takes place in the tissues and body fluids in the presence of infection.

In the beginning, this phenomenon of hypersensitiveness was observed to follow the injection of a foreign protein, and most of the early investigators confined their observations to those conditions following the injection of serum, milk, egg albumin, etc. Up to this time the subject was of purely academic interest, but when the diphtheria and tetanus antitoxins came into general use, the pe-



culiar and paradoxical results which occasionally followed their injection, and which were apparently analogous to anaphylaxis, caused a new and practical interest in this subject. Then when Rosenau and Anderson, Vaughn and Wheeler, Kraus and others demonstrated the fact that bacterial proteins could act as anaphylactogens, the importance of this peculiar phenomenon was realized and research men all over the world started investigations of the various phases of immunology which bear upon this subject.

Many results have been published, much data collected, and many interesting hypotheses advanced to explain just what hypersensitiveness is and how it is brought about. It is believed now that in general this symptom-complex is due to the fact that when a foreign protein is injected into the body, there is an alteration of the reaction of certain cells, and they become unusually sensitive or susceptible to the same or closely related foreign protein, so that following a second injection of this substance, harmless in itself, there follows a severe train of symptoms which we call anaphylaxis.

Perhaps, one of the best explanations of this is given by Vaughn and Wheeler, who believe that with the first injection of the foreign protein, the cells are stimulated to produce a specific ferment that splits it into several different entities, one of which at least is toxic. This toxin is, however, so slowly produced after the first or sensitizing dose that it is absorbed or fixed and rendered harmless. This ferment, or zymogen, continues to be formed in the cells, and following the second or intoxicating dose, after a proper interval has been allowed to elapse, this ferment is activated and rapidly splits up the protein with the liberation of the toxic moiety, which promptly results in the production of the symptoms of anaphylactic shock.

Another explanation that has many advocates is the 'cellular theory.' According to this hypothesis, hypersusceptibility of the tissues occurs as the result of the development by certain tissue cells of specific receptors. By means of these receptors, these cells fix the injected protein and are themselves injured or destroyed. In order that this theory be tenable, it must be assumed that all foreign proteins possess harmful properties for those cells able to fix them, and though proteins differ greatly in chemical arrangement, they are all capable of affecting sensitized cells in a like injurious manner.

Exponents of the latter theory explain passive or transferred anaphylaxis on the ground that these receptors capable of binding protein float free in the blood-stream, and when withdrawn and transferred to a second animal they are again fixed by the tissue cells. The advocates of the 'humoral' theory explain this same phenomenon of passive sensitization by saying that the ferment or protein-splitting substance produced by the tissues of the actively treated animal, and which is present in all the body fluids, is simply transferred to the second animal, and that when the antigenic protein is injected it is split and the harmful symptoms produced.

Considerable doubt has been thrown upon the cellular hypothesis, which presupposes a definite incubation period to elapse between passive sensitization and intoxication, during which time the free receptors are fixed by the tissue cells, by the recent work of Gurd, who undertook some experiments to prove that this incubation period was not necessary to the production of anaphylaxis. The

technique observed was as follows: The animals were anesthetized with ether and placed upon a guinea-pig board with head extended. The jugular veins were exposed and the animal allowed to regain partial consciousness. The two specimens of sera, *i. e.*, the immune transferred serum and the antigenic protein, were then injected directly into the jugular veins at intervals of from one to three minutes. In all cases the sensitizing serum was injected first. In those cases in which more than 1.5 c.cm. of fluid were injected, a small amount of blood was withdrawn before the injections were begun. As soon as the injections were completed the skin edges were drawn together and retained by small clamps. The animal was then placed upon its feet, the better to observe its symptoms. In the majority of the experiments the sensitizing serum was obtained from rabbits immunized to sheep-serum. Such serum was invariably used fresh not longer than four hours after removal from the rabbit. The antigenic protein employed consisted of sheep serum. This was obtained fresh for each set of experiments and was used without the addition of any preservative. Small guinea-pigs ranging in size from 200 to 300 grm. were used.

By this method Gurd was able to produce the typical symptoms of anaphylactic shock without the elapse of any interval of time that might be called an incubation period. This work demonstrates in a striking manner that the so-called incubation period is not an essential characteristic of transferred anaphylaxis. His conclusion is that: "The possibility of immediate transferred anaphylactic shock indicates that the theory of parenteral digestion with the liberation of toxic split products is the most reasonable explanation for the phenomenon of anaphylaxis."

Since 1909, following the work of Friedberger and Friedman, most of the advocates of the cellular hypothesis have contended that the reaction between antigen and antibody, following which the symptoms of anaphylaxis are produced, occurs in the blood. The observations of Doerr, Dale, who used the graphic method of Schultz, and Weil, following a modification of the same technique, have shown that while the circulating antibody probably plays a small part in this reaction, it is the cellular antibody that is mainly responsible for the binding of the antigen.

The method used in Weil's work was a very ingenious one and the technique employed was as follows: "Guinea-pigs were passively sensitized by the injection of the serum of a rabbit immunized to horse-serum. The injections were made either subcutaneously, intravenously, or intraperitoneally, at varying intervals of time, calculated so as to fall within the latent of pre-anaphylactic interval. These pigs were killed, the two horns of the uterus suspended in the Dale apparatus, the horns being kept in separate tanks. One horn which may be considered as a control was at once tested with horse-serum. If it responded with a contraction, the fact was apparent that the latent period had been overstepped and the experiment was discontinued. If no contraction ensued, it was clear that the latent period was still in force. The control horn was then thoroughly washed with Locke's fluid and the experiment was continued. Both horns were kept in Locke's fluid at a temperature varying from 38 to 40° C., while a constant stream of air bubbles was forced through the fluid. After an interval of time

varying from one to several hours, the sensitiveness of both horns was again tested by the application of the horse-serum." He regards the contractile response upon the addition of horse-serum as unquestionable evidence of sensitization thereto, and concludes that the muscle has become sensitized after removal from the body during its sojourn in the bath. His theoretical deduction from this is "that the cells induce some change in the foreign antibody after they have absorbed it, by virtue of which they become sensitized. It is quite clear that no further absorption of antibody from the blood can occur after the uterus has been removed from the body. Indeed, in some of the experiments the vessels were thoroughly washed out after death. Consequently sensitization must be due to some further change which occurs in and through the cells. Cellular activation of antibody is therefore the basis of the anaphylactic reaction. Moreover, the increased avidity of cellular antibody constitutes a most important factor in the processes of immunity."

In the light of these widely differing results, it is obviously difficult to form any very definite conclusions, but with the accumulating data and information concerning the various phases of this question, it is certain that many things hitherto unexplained will be made clear, and out of the mass of facts now apparently disjointed and unrelated will come a definite understanding of the reactions that occur between the cells of the body and foreign invaders.



## DIAGNOSTIC AND THERAPEUTIC NOTES.\*

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Pinch (Report of the Radium Institute, London, 1914) states that the year 1914 was one of great activity at the London Radium Institute, 746 cases receiving treatment. Of these a little more than half were malignant neoplasms of various kinds. In many of these cases, all of them unselected, the definite notation of results is deferred for obvious reasons. The majority, however, showed improvement, and a few were apparently cured. Among these were 4 epitheliomata, 1 cancer of the uterus and 1 of the breast, 3 sarcomata and 41 rodent ulcers.

The radium was used either in the form of radium salts or radium emanation, the therapeutic effect being identical. The salt used was always the insoluble radium sulphate. For superficial work, flat varnished applicators were used; for deeper work, capillary glass tubes, closely packed with radium sulphate.

The radium emanation was sometimes drunk or injected, but was chiefly used locally in glass tubes or metal containers just like the radium salt itself. Such emanation applicators are often of the greatest value in the treatment of malignant growths, as in them it is possible to concentrate the activity per unit area to a very high degree.

For example, the 100 mgrm. tubes of radium sulphate used in the Institute measure 4 cm. in length by 0.2 cm. in diameter. It is quite easy to make an emanation tube of equal activity measuring only 0.6 cm. in length by 0.13 cm. in diameter. Such a tube can be enclosed in an iridium-pointed platinum needle with walls of 0.3 mm. in thickness, thus forming a very small but extremely powerful apparatus for the treatment of nodules in tongue, palate, breast, or other organs.

The contention is sometimes raised that the loss of activity due to the gradual decay of the emanation impairs the usefulness of these applicators, but this objection can be readily overcome.

Radium emanation falls to half-strength in 3.85 days, losing 16 per cent. of its initial activity during the first twenty-four hours.

An exposure rarely exceeds twenty-four hours in duration, and if it be decided to give a treatment for that time with a radium emanation applicator of, say 100 mgrm. strength, the apparatus leaves the laboratory with an initial activity of 109-110 mgrm. At the end of twenty-four hours its activity will have fallen to 92-93 mgrm., so that its mean activity throughout that period will have been approximately that of 100 mgrm.

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A TREATMENT FOR INOPERABLE CANCER.—Beebe (*New York Med. Jour.*, May 15th, 1915). With some hesitation, Beebe, professor of experimental therapeutics at Cornell, makes this prelimi-

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\*On account of lack of space this article was omitted from the Special Cancer Number (July).

nary report on a method of treating cancer originated by Alexander Horowitz, an Austrian biologist and chemist. As administered by Horowitz, the treatment consisted of the repeated application of a poultice to the affected parts and the administration internally in the form of an extract, either as a liquid or as a pill, of certain substances contained in the poultice itself. The application of the poultice was followed by an intense reddening of the skin and, if the application was prolonged in the beginning of the treatment, blistering might be produced. It had the effect of active counter-irritation. However, the effect went farther than this. The malignant mass in many cases gradually became edematous, softer than before, and sections of tissue taken in and about the tumor showed that the lymphatics were engorged with leucocytes, and if the skin was broken there was a profuse serous discharge. The exudate which later on was produced in considerable quantities in the treated area contained large amounts of broken down cancerous material, serum, and leucocytes. The leucocytes were mainly of the large and small mononuclear type. There was at the same time an improvement in the general condition of the patient, evidenced by the relief from pain, increase in appetite, and a marked improvement in the toxemia or cachexia accompanying the disease.

The therapeutic agent employed in this treatment is a complex one, and it is believed that it has not been heretofore employed in the treatment of cancer. The powder from which the poultice is made contains a considerable number of substances of plant origin. Seeds, roots, bark, and flowers taken from a number of different plants are prepared in the form of a powder, from which Horowitz made a poultice. The powder contains the following substances: *Menyanthes trifoliata*, *Melilotus officinalis*, *Mentha crispa*, *Brassica alba*, *Anemone hepatica*, *Viola tricolor*, *Anthemis*, *Fructus colocynthis*, *Lignum quassiae*, *Urtica dioica*, *Radix rhei*, *Hedera hyssop*.

Such a preparation cannot but arouse scepticism if not mockery, and properly so. Nevertheless the cases observed by Beebe unquestionably showed remarkable improvement and the observations of a man of his calibre cannot be flouted without more ado. In spite of the decidedly bizarre character of the remedy, he believes that the evidence warrants its further use.

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MEDICAL ASPECTS OF CANCER.—Bulkley (*Med. Record*, May 15th, 1915). A study of cancer incidence in various countries leads the writer to the conclusion that an improper dietary is the fundamental cause of the disease. He finds that cancer has increased in proportion to the consumption of the three articles, meat, coffee and tea, and alcohol.

In England, where the consumption of meat has doubled during the past fifty years and recently was 130 pounds per capita yearly, cancer mortality has increased fourfold. In Italy, where the consumption of meat is the least of any of the European countries, cancer is least frequent, and in the county of Kerry, Ireland, where meat is seldom eaten, the death-rate from cancer is not one-third that of England. The same comparison may be made between a number of other countries, did time permit. The United States in 1909 consumed much more meat than England—namely, 172 lb.

per capita, and, as already stated, cancer has increased over 25 per cent. since 1900.

Alcohol must also be accredited with a portion of the increase of cancer in both these countries, as it is well known that the disease presents a far greater augmentation in those occupations where alcoholic drinks are indulged in, as in bartenders, printers and others.

Coffee has been shown to have its largest per capita consumption in Holland, where the cancer death-rate is among the highest, while Hungary is the smallest consumer of coffee, and the cancer mortality there is among the lowest, namely 39 per 100,000 living. The people of the United States consume one-third of all the coffee produced, more than Germany, Austria, Hungary, France, and the United Kingdom combined. England and her colonies, where cancer is steadily increasing, consume one-half of the world's output of tea.

He concludes that a successful prophylaxis against cancer must be based upon an avoidance or at least a restriction of meat, alcohol and coffee. He even reports a number of cases suggesting that such a regimen may lead to the non-surgical cure of malignant disease.

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RADIUM AND MESOTHORIUM IN CANCER OF THE UPPER RESPIRATORY TRACT.—Albanus (*Bruns Beitr.*, 92, 1915). At Hamburg-Eppendorf astonishingly good results are obtained in the treatment of cancer of the upper respiratory and digestive tract by means of radium and mesothorium. While no claims are as yet made in regard to permanent cures, the cases appear most promising. So much so, that a trial of the treatment seems permissible even in operable and not quite incipient neoplasms of the mucous membrane. Large doses are requisite. Not less than 50-100 mgrm. of radium bromide should be used, although there is no gain in using more than 200 mgrm. The radio-active substance is best applied in tubes or capsules.

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GASTRIC CANCER IN A NINE-YEAR-OLD BOY.—Karl (*Deutsch. med. Wochenschr.*, No. 13, 1915). The boy had vomited blood in September, 1914, and had vomited practically all food ever since. When he entered the hospital in December, he was nearly literally skin and bones, weighing 28 lb. A nodular mass could be felt just to the right of the navel. At operation, a tumor was found at the pylorus, fairly movable, and was removed with all the neighboring healthy tissue. The gastric stump was implanted into the jejunum. The result was extremely good. During the first three weeks he gained 18 lb., and in March weighed 59 lb., having more than doubled his weight. The tumor was found to be a small-celled, infiltrating cancer. The patient is apparently the youngest case of gastric cancer on record.

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THE LOCAL INCIDENCE OF CANCER IN FRANCE.—Green (*Edin. Med. Jour.*, 1915, No. 1). Some years ago, Bertillon published an investigation into the incidence and mortality of cancer in the various departments of France. He found a marked variation in the prevalence of the disease, the latter being great in central and



northeastern France, small in the south and west. The cause of this unequal distribution has been much discussed; Green believes it lies in the character of the fuel used. And indeed it would seem that wherever coal is burnt, especially if rich in sulphur, there cancer is prevalent; wherever wood or charcoal is used, there cancer is rare. A similar situation had already been shown to exist in Scotland.

It is, of course, a far step, from the point of view of scientific statistics, to conclude that, because the use of coal and the prevalence of cancer go hand in hand, the former must be the cause of the latter. Nevertheless, the coincidence is an interesting one and may some time prove important.

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CANCER OF THE PROSTATE.—Judd (*Surg., Gyn. and Obstet.*, 1915, No. 3). The early diagnosis of prostatic cancer is often extremely difficult. A general physical examination usually shows a healthy robust individual. Rectal examination may reveal a small prostate gland, or, if hypertrophy is associated with the cancer, the enlargement may be quite marked. If on palpation the surface of the prostate is rough with hard nodules, it is always suspicious since in the benign cases the prostates are nearly always smooth unless there is associated inflammation or calcareous deposits in the substance of the gland. In benign cases they are often lobulated though their surfaces are smooth. In cancer, if the surface is smooth, the prostate is very hard. It is sometimes impossible to discover malignancy, when it is associated with hypertrophy, or to distinguish malignancy from chronic inflammatory prostatitis. Sometimes the gland as a whole is soft, with a small hard nodule in one lobe; sometimes no such nodule could be felt, even though cancer was present.

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SYMPTOMS AND SIGNS OF GASTRIC CANCER.—Smithies (*Jour. Am. Med. Ass.*, February 20th, 1915). From the study of 712 cases, operatively and pathologically proved to be gastric cancer, Smithies concludes that we have no proved clinical procedure, other than history taking, which enables us to make early diagnosis of gastric cancer. Our so-called early diagnoses are usually lucky guesses, or are incidents in gastric exploration. The only dependable early diagnosis is made after laparotomy by a capable surgical pathologist by means of sections of tissue stained and examined under high power.

Information obtained by means of the roentgen ray, by the estimation of the formol index, by the Wolff-Junghans' test, or by the edestin digestion test, sometimes is of aid in excluding cancer in its early stage, but is of relatively little value in determining for us the presence of the earliest type of cancer—the cancer which we can honestly say is surgically curable.

## BOOK REVIEWS.

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THE MENTAL HEALTH OF THE SCHOOL CHILD. The Psycho-Education Clinic in Relation to Child Welfare. Contributions to a New Science of Orthophrenics and Orthosinatus. By J. E. Wallace Wallin, Ph.D., Professor of Clinical Psychology and Director of Psycho-Educational Clinic, School of Education, University of Pittsburgh, etc. etc. New Haven: Yale University Press. 1914. Price, \$2.00.

This is a collection of essays on various subjects which appeared at different times in the last few years gathered together under the title, "The Mental Health of the School Child." The author in his introductory chapter acknowledges the weakness of treating a subject by means of a collection of essays written without reference to one another and strung together with no plan or purpose. The reviewer can only admire the frankness of the author in admitting from the start what is the chief weakness of his book.

The term psychologic clinic is loose enough to admit of almost any application, therefore the title of the various chapters bear little relation to the central theme of the book, which is, as before stated, the mental health of the school child.

Wallin attempts to cover a very diversified lot of subjects, the intrinsic difficulty and complexity of which do not appear to deter him from making very dogmatic statements. He is fond of using the term 'scientific psychology,' by which it is presumed he means experimental psychology. The collection of test data by various intrinsic or simple measures, as the case may be, is for him the complete purpose of psychology; yet he is aware, the reviewer feels sure, that methods of analysis are still useful and much can be hoped for in the understanding of mental phenomena through other means than those set down in his book; an inheritance, no doubt, of the method associated chiefly with the great personality to whom he dedicates his book, Stanley Hall.

There is much in these essays which is of value and much to which exception may be taken. This amounts, the reviewer is bound to admit, to an acknowledgment of the merit of the book. So intricate a subject properly written about must touch upon subjects which are at present still debatable, but the spirit of cocksureness would seem to be out of place in a scientific psychologist, even one whose passion appears to be data collecting.

The best chapters, or rather the best of the scattered paragraphs, are those devoted to the Binet-Simon intelligence tests. These the author relegates to their proper sphere, simply a means of obtaining a preliminary outline of a child's mental equipment. He has something to say further of the amateur intelligence tester. He speaks rather critically of the untrained or unpsychological tester of a child's mentality by the Binet-Simon scale, but if Wallin admits that the tests themselves are crude and the conclusions are superficial; why should he blame the amateur who chooses to pursue these simple tests? The reviewer objects to Wallin's supercilious attitude, of which this is a fair example. Anyone with a little patience and practice can carry these tests out, as the reviewer has had frequent occasion to observe, and Wallin himself must admit that it is impossible at the present time to obtain a sufficient number of experts to examine all the cases that need this preliminary examination.

The main criticism to be directed against this book is the diffuseness of style, constant repetition and reiteration of statements, the supercilious air, hidden under the word scientific. The air of antagonism seems altogether out of place in a book of this kind. It arouses in the reviewer's mind the feeling that perhaps the author is not quite so sure of his subject as his lofty superiority to the more humble workers in this field leads one to suppose. Much that he says in a contentious manner is freely admitted and has been admitted for some time. It is entirely unnecessary to write two chapters to show the necessity of examining school children for mental and physical defects. This is a fact so eagerly and freely admitted that there is little place in anyone's book for an argument in support of it.

Wallin's detachment from psychiatry and neurology is a bit strange, as is his easy way of settling the question of criminology, and many other debatable



subjects. One questions seriously whether a strictly scientific psychologist in Wallin's use of the term might not be a bit more at ease if his clinic showed even a tincture of medical knowledge and medical spirit. One wonders also if the psychologist to be an effective worker might not have opened the windows of his laboratory and gazed for a few minutes into a neighboring hospital or clinic and learned the first precept upon which medical diagnosis is based; that is, never to dogmatize.

There is a great deal of work to be done on the mentality of the child, more than is even hinted at in this book of Wallin's, but little will be accomplished unless each worker makes his work as all-embracing as possible and does not attempt to limit his interest by the limitations of his training.

Wallin's book ought to be read in spite of the defects which have been pointed out, for it does state a problem, it does contain much truth and much controversial matter, and it is full of the personal point of view of the author. A book that is all this is a good book, but in this instance it is a bit irritating.

**PATHOLOGICAL TECHNIQUE.** A Practical Manual for Workers in Pathological Histology and Bacteriology. Directions for the Performance of Autopsies and for Clinical Diagnosis by Laboratory Methods. By Frank Burr Mallory, A. M., M. D., Associate Professor of Pathology, Harvard Medical University Medical School, etc., and James Homer Wright, A. M., M. D., S. D., Pathologist to the Massachusetts General Hospital, etc. Sixth Edition, Revised and Enlarged, with 174 Illustrations. Philadelphia: W. B. Saunders Company. 1915. Price, \$3.00.

Mallory and Wright's "Pathological Technique" has well won the first place in every laboratory as the 'laboratory bible,' so that it is a pleasure to see the book go into a sixth edition. To quote from the preface: "This edition, like its predecessors, contains a number of additions, partly of standard methods which have not been incorporated earlier because they seemed of less use to the pathologist than to the histologist, partly of new methods which have recently appeared. Bielschowsky's silver impregnation stain for nerve-fibers and for connective-tissue fibrils and reticulum has proved of great value in certain lines of pathological work. Bensley's excellent methods for the demonstration of mitochondria and other cytoplasmic granules, especially in the cells of the pancreas, should prove helpful in many ways. G. Herxheimer's alcohol-acetone solution of Sharlach R. for staining fat offers decided advantages over the solution heretofore in use, giving better results and acting more quickly.

"Other additions are the complement-fixation test for gonorrheal infection, Lange's colloidal gold test for syphilis of the central nervous system, the complement-fixation test for echinococcus cyst, and Eycles and Sternberg's silver impregnation method for staining the *Treponema pallidum* in sections. Short sections, descriptive of the bacillus of pertussis, of the *Blastomyces*, and the *Sporothrix schenckii* have also been inserted."

**DISEASES OF THE BRONCHI, LUNGS, AND PLEURA.** By Frederick T. Lord, M. D., Visiting Physician, Massachusetts General Hospital, etc. etc. Illustrated With 93 Engravings and 3 Colored Plates. Philadelphia: Lea and Febiger. 1915. Price, \$5.00.

One must always welcome a textbook founded upon the knowledge gained from a large clinical and pathological material. It would seem, however, that in works devoted to special phases of medicine a somewhat greater liberty in the arrangement of the material than is usual in the ordinary textbook might be allowed without provoking criticism. Thus there is a distinct need for a free discussion of the subject of bronchoscopy, its relative value in comparison with other diagnostic and therapeutic means, the fields of its usefulness, its dangers, etc. While it is true that these points are discussed more or less freely in books on bronchoscopy, it is of particular value that they be viewed from the standpoint of internal medicine. The chapters on lung abscess and empyema lack the clear exposition which the more recent work, particularly of the French writers, might lead one to expect. Our increasing knowledge of encapsulated empyema, particularly of the interlobar type with its tendency to erode into the lung and give rise to pleural vomica, has not been used to draw the clearer clinical pathological picture which this chapter in medicine has so long needed. In short, the reviewer believes that authors of textbooks of this type upon special phases of internal medicine have no right to bring forth merely an amplified edition of the usual textbook chapters on the subject, but should enter more freely into those particular questions which



it is not the function of the general textbook to discuss. This work of Lord's sets forth in extended form the experience of the Massachusetts General Hospital in the field of pulmonary diseases. A valuable feature in each chapter is the literature reference, embracing as they do the more important articles on each topic.

**THE OPERATIVE TREATMENT OF CHRONIC INTESTINAL STASIS.** By Sir W. Arbuthnot Lane, Bart, M. S., F. R. C. S., Senior Surgeon to Guy's Hospital, and Emeritus Surgeon to the Hospital for Sick Children, Great Ormond Street. Third Edition. Chicago: Chicago Medical Book Company. 1915. Price, \$4.00.

This third edition of Lane's work substitutes the term chronic intestinal stasis for chronic constipation and is by and large an attempt to attribute many and varied diseases to inadequate sewage. The application of the mechanical laws governing crystallization of lines of force in the skeleton to modification in the shape, structure and function of the viscera is the foundation of Lane's conception. The author's line of argument is in its essentials simple and direct. The appendix, the cecum, and the whole of the large intestine are rudimentary and their removal is attended by happy results. The ills that are attendant upon an obstruction of the ileal effluent are numerous: rheumatoid arthritis, Still's disease, tuberculosis, exophthalmic goitre, and Raymond's disease, to mention but a few.

The while one reads with scepticism he feels a subtle influence stealing over him that bids him say to himself, "What if Lane is right?" For a method of treatment, based on a new theory of disease, advanced by a man of Lane's standing, that shall effectually cure tuberculosis and cancer is most enticing. This effect of the whole work is not a little due to Lane's unadorned and powerful style.

For the ordinary reader, however, the propaganda (for Lane is a propagandist) does not carry conviction, and it will be many years before ileocolostomy with colectomy becomes the everyday operation that Lane's advocacy would make it.

**SURGERY OF THE BLOOD VESSELS.** By J. Shelton Horsley, M. D., F. A. C. S., Surgeon-in-Charge of St. Elizabeth's Hospital, Richmond, Va. A Founder and Fellow of the American College of Surgeons, etc. etc. Illustrated. St. Louis: C. V. Mosby Company. 1915. Price, \$4.00.

This volume enriches the already rich field of vascular surgery, and illustrates anew the value of the tendency on the part of American publishers to emphasize the value of specialized monographs.

The book is written along much the same lines as is the recent monograph by Bernheim, and differs from it only in that it is of fuller content. As might be supposed, Horsley gives more space to his own technique of blood-vessel surgery than was credited to him by Bernheim, but this very fulness constitutes one of the virtues of the book.

There are three hundred pages devoted to history, technique and all possible variations in blood-vessel suture work, transfusion, hemorrhage, aneurysm, thrombosis and embolism, blood-vessel tumors, varicose veins, varicocele, and hemorrhoids. Two notable features characterize the volume—namely, the thoroughness with which every topic is handled and the excellently clear and helpful illustrations.

We feel, as a matter purely of individual judgment and preference, that there is no occasion to include such topics as thrombosis, embolism, varicocele, hemorrhoids and intestinal resection and transplantation in a volume entitled Blood-Vessel Surgery; and yet we realize fully that the title very rightly embraces all the topics between the two covers of the book.

**THE OPERATIVE TREATMENT OF FRACTURES.** By Sir W. Arbuthnot Lane, Bart., M. S., F. R. C. S., Senior Surgeon to Guy's Hospital, and Emeritus Surgeon to the Hospital for Sick Children, Great Ormond Street. Second Edition. London: The Medical Publishing Company, Ltd. (Chicago Medical Book Company, Chicago, U. S. A.) 1914. Price, \$4.00.

This second edition of Lane's now famous treatise, does not differ sufficiently from the first edition to call for a detailed review. The profession has gradually learned not only the principles underlying the method of Lane in treating fractures, but also the important fact that Lane does not advocate the open operation for every fracture that the surgeon encounters. In the opening paragraph, Lane states that his custom is "to operate on all cases of

simple fractures of long bones in which I was not able to obtain accurate apposition of fragments, when the restoration of bone to its normal form was of mechanical importance to the individual." In this sentence, Lane plants his standard. It is unfortunate that he does not emphasize this doctrine; for by a moderate degree of reiteration, he could impress the general profession with the undesirability of indiscriminate operations upon fractured bones.

The volume is exceptionally well printed and illustrated.

**DIABETES MELLITUS.** Designed for the Use of Practitioners of Medicine. By Nellis B. Foster, M. D., Assistant Professor of Medicine, Cornell University, etc. etc. Philadelphia: J. B. Lippincott Company. 1915. Price, \$3.00.

The author in this excellent book has brought together the clinical with the laboratory and theoretical sides of his broad subject. Intended primarily for the clinician, the chapters on symptomatology, diagnosis and treatment are written with that rare skill which allows an author to present concise information without losing sight of broad generalizations. The chapter on treatment is particularly valuable. Using as a framework a few typical case histories, he discusses by means of charts and diet lists and in an eminently practical manner the management of cases presenting various degrees of severity. The chapter also contains a few analyses and recipes for diabetic foods. This latter feature might well be extended and give added value to a very useful volume.

**HANDBOOK OF PHARMACOLOGY.** By Charles Wilson Greene, A. B., A. M., Ph.D., Professor of Physiology and Pharmacology, University of Missouri, etc. etc. With Seventy Illustrations, Including Many New and in Colors. New York: William Wood and Company. 1914. Price, \$3.50.

The admirable arrangement of this work makes it of particular value to the undergraduate student. The action of the drugs is studied in its effects upon various organs and tissues considering each of these separately. In this way the proper relation between pharmacology and physiology is preserved and the proper introduction to a rational therapeutics is assured. No noteworthy departure from the usual teachings of pharmacology have come to the reviewer's notice. But he knows of no work that is more successful in placing before the student in a form easily grasped the fundamental facts of pharmacology. The author seems to possess in a high degree that faculty for teaching which makes use of many means to the one end of simplicity.

**THE CLINICS OF JOHN B. MURPHY, M. D.,** at Mercy Hospital, Chicago. Volume IV, Number II (April, 1915). Octavo of 197 pages, 47 illustrations. Published Bi-Monthly. Philadelphia and London: W. B. Saunders Company. 1915. Price per year: Paper, \$8.00; Cloth, \$12.00.

This volume of the "Clinics" varies in no essential detail from those that have gone before, save that it is used as a medium for presenting a highly interesting and elaborate paper by Dr. Mix on Spontaneous Massive Coagulation of Cerebrospinal Fluid, with Xanthochromia. The case history and the operative findings accompanying this report by Dr. Mix are of extraordinary interest.

The rest of the volume calls for no special comment, for the reason that it covers ground that has already been covered by Dr. Murphy many times before.

**THE CHEMICAL EXAMINATION OF WATER, SEWAGE, FOODS AND OTHER SUBSTANCES.** By J. E. Purvis, M. A., University Lecturer in Chemistry and Physics as Applied to Hygiene and Public Health, St. John's and Corpus Christi Colleges, Cambridge, and T. R. Hodgson, M. A., Public Analyst for the County Burroughs of Blackpool and Wallasey, etc. etc. Cambridge: At the University Press (G. P. Putnam's Sons, New York). 1914. Price, \$2.75.

This volume deals with a special branch of practical hygiene and will be of value mainly to those who are interested in the technical side of such subjects as water analysis, including the analysis of sewage waters, air analysis, the examination of food-stuffs including the detection of adulterants, etc. etc. The standards used are in the main those established by the laws of Great Britain.



THE PHARMACY HANDBOOK. By F. W. Crossley-Holland, F. C. S., Pharmacist, etc. etc. New York: Oxford University Press. 1914. Price, \$2.00.

This volume is intended as an aid to pharmacists in matters not readily found in pharmaceutical textbooks and includes some chapters not strictly pharmaceutical. While we agree as to the usefulness of such chapters as those on the Newer Therapeutic Remedies, Serums, Vaccines, and Pharmaco-ethics, we have distinct doubts as to the wisdom of introducing diet tables for biliousness (!) and sundry other conditions. The book is possibly better suited to conditions as they exist in England than to our own needs.

THE CLINICS OF JOHN B. MURPHY, M. D. At Mercy Hospital, Chicago. Volume IV, Number 1, February, 1915. Published Bi-Monthly. Philadelphia: W. B. Saunders Company. 1915. Price per year: Paper, \$8.00; cloth, \$12.00.

This volume of the "Clinics" shows a distinct improvement in editing over the various issues of the past year. In addition to this, the clear-cut illustrations serve as valuable adjuncts to the text. The substance of the clinics, however, contains nothing new. We have commented before on the inevitable reiteration inherently bound up in any attempt to publish the work of any one clinic at frequent stated intervals. We also have expressed previously the opinion that, since these "Clinics" are supposed to be Murphy's clinics, there is no call to incorporate in them the so-called talks by visiting medical men. In the present volume Dr. Gaylord discourses entertainingly on cancer research, but his discourse, if it is not out of place, at least does not lend homogeneity to the book.

The clinics comprise the following subjects: Intestinal fistulæ, appendicitis, aneurysm of the brachial artery, sarcoma of the femur, bone transplantation, dislocation of the spine, compound fracture of the malar bone, ununited fracture of the clavicle, carbuncle of the arm, and contraction of cicatrices of the finger.

KIRKE'S HANDBOOK OF PHYSIOLOGY. Revised and Rewritten by Charles Wilson Greene, A. M., Ph.D., Professor of Physiology and Pharmacology, University of Missouri. Eighth American Revision. With Five Hundred and Nine Illustrations, Including Many in Colors. New York: William Wood and Company. 1914. Price, \$3.00.

No introduction is necessary in presenting this well-established work on physiology. The present edition has kept pace with the recent developments in the various fields particularly those of internal secretion and the principals of heredity. The recognition which the work has required as a standard textbook makes detailed comment quite unnecessary.

INFANT-FEEDING. Its Principles and Practice. By F. L. Wachenheim, M. D., Attending Pediatricist, Sydenham Hospital and Mount Sinai Dispensary, New York City. Philadelphia: Lea and Febiger. 1915. Price, \$2.00.

To anyone desiring a compact reference hand-book of infant feeding, this book of Dr. Wachenheim's may be safely recommended. In addition to discussion of addresses of milk composition, there are valuable chapters on milk modification in disorders of digestion. Finkelstein's later work is fully reviewed. The feeding of older children is also carefully considered.

The book is of decided value, and will surely prove invaluable. An excellent bibliography closes it.

MATERIA MEDICA AND THERAPEUTICS. A Text-Book for Nurses. By Linette A. Parker, B. Sc. (Columbia Univ.), R. N., Bachelor's Diploma in Education, Teachers' College, etc. etc. Illustrated with 29 Engravings and 3 Plates. Philadelphia: Lea and Febiger. 1915. Price, \$1.75.

In this little book the effort has been made to give only the important and practical points of materia medica. The material is well arranged and the illustrations and diagrams, which lend much to the clear understanding of the text, are particularly well chosen.



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## EDITORIAL.

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### THE STIGMATA OF THE QUACK.

Those eminently respectable physicians who have been in the habit of walking in the sunlight without their hats in the hope that their approaching baldness would be stayed by the sun's rays and those eminently respectable physicians who have used Sabouraud's prescriptions, Max Joseph's prescriptions,\* Orlowski's prescriptions,\*\* and the hundreds of others which appear in our medical journals with a regularity that indicates a deep interest on behalf of suffering humanity, should cease their strenuous labors, for no less an authority than Dr. W. A. Evans† has made the statement that the indubitable mark of the quack is a luxuriant growth of hair. What success, if any, has attended the followers of the boys of the Blue-Coat School in London, who are celebrated for their growth of hair on account of the no-hat theory, or the enthusiasts of the multifarious scientific prescriptions which are at their beck and call in nearly every issue of our recognized medical journals, it is not within the statistical knowledge of the writer of these lines to affirm; but even though he may be pessimistic as to the results achieved by the assiduous rubbings of the scalp with various solutions and ointments in the hope of reducing the spherical spot that is modest enough to hide itself under a thatch in the beginning but is brazen and proud and declarative later on, there may have been cases that have escaped his ken—cases which, although the hair before the magic solution reached its roots was a sad affair at best, took a new lease of life and plenty and abundance were the reward. Now, though it can be said with a delightful and engaging degree of truth that a few isolated cases

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\*A Short Handbook of Cosmetics. New York: E. B. Treat and Co. 1914.

\*\*Die Schoenheitspflege. Wuerzburg: Curt Kabitzsch. 1913.

†Some Medical Fakers. (*Chicago Daily Tribune*, August 19th, 1915.)

should not stand as a warning, the thought cannot be objected to by any intelligent reader that the smallness of the number does not weaken Dr. Evans's argument to the effect that great care should be exercised not to husband the new growth too carefully or too long, or the rest of the hair, for that matter, lest one of the stigmata—he mentions two of a positive nature—be the open sesame to a scrutinizing public, ever on the alert to differentiate between the regular and irregular practitioner! Still with our limited knowledge of human nature it must be said that the staunch attitude to keep one's hair from being cut short, once it has been obedient to the kindly and beneficent influences of hair tonics, is a very great temptation, indeed; for not only would one be interested in seeing the new hair grow longer and longer each day, but one's pride would be of prime importance as an obstacle to the shearing process. Such thoughts as these are in consonance with a normal mentality, but even so, now that we have been enlightened as to one of the stigmata of the quack, is not this the time to inveigh against such pride and to warn one that if he overindulges it, the length of his hair will destroy all efforts on his part to proclaim his respectability as a regular practitioner?

The matter of how long or how short one should wear one's hair, especially as this applies to the physician, has always been a subject of dispute. In case the young and aspiring physician elects to wear his hair short, as is the fashion to-day and as was the fashion some years ago, a tried and trusty practitioner of great respectability and many years' experience will shake his head in disapproval of such juvenility, and even go so far as to predict that success cannot attend one who endeavors to look youthful and trim. Again should the young and aspiring physician conclude that a haircut really is unnecessary, that straggly hairs denote a soul above the frivolities of the day, therefore one of science, the same practitioner will denounce him for his lack of neatness and again predict that he is doing everything to ward off success. It need not be added here that the gentleman who is giving forth these Cassandra-like predictions is already bald; that must have been apparent to the reader from the start. But why is baldness the badge of respectability in the medical profession and longish hair,—not the sort that rests on one's collar *a la* charlatan, but long enough to cover one's head completely and hide its ugly contours, so very disreputable? And why is hair worn closely clipped always allied with the thought that the wearer is superficial and frivolous?

According to Dr. Evans there is another stigma by which the quack can always be known, and this one is so distinctive and belongs so decidedly to the realm of quackery that no respectable physician need for a moment quake in his boots lest he be tempted

to indulge in it. No physician, it can be asseverated here, would think of changing his name, be it even so undistinguished as Smith or Jones, to an Indian one. We have known quite a number of physicians who have started out in life by being plain Harry B. Smith or Walter H. S. Jones, change their names to H. Braddon Smith and Walter Henry Smithfield-Jones. But this is a bit of Anglomania that is quite pardonable and is not a stigma that indicates the quack. It is really excessive respectability that prompts them to do it and a commendable spirit to show that they are superior to the other Joneses and Smiths in their community. But can the same be said of the quack who changes a plain name into Pushmataha or Wewoka?

For quite a number of years various writers have made extensive studies of the attributes of the quack and have expressed so many opinions that oneness of thought among the readers has been out of the question. That it is an extreme delight to reach at last the clear water of simplicity after wading through the muddy depths of conflicting ideas, ought to be appreciated by all; and if it is true that long hair and an Indian name are the real stigmata of the quack, the reader, who has had brain fag after vainly attempting to apply the lessons, conned from the articles he read, to living persons whose methods were not in accord with his high principles, in the hope of settling the vexed question as to who is respectable and who disreputable in the medical profession, should at once discard his old ideas and adopt the new ones set forth in these lines. But in his first enthusiastic moments let him not be too greatly prejudiced for the bald-headed physician and too intensely critical of the long-haired one. It would be well, perhaps, to inquire of a dermatologist if the bald-headed physician ever made the slightest attempt to restore his hair, and further, of his friends, if he did not neglect his scalp altogether so as to look respectable and prosperous in a bald-headed way? For even a bald-headed physician may at times take a step aside into a mild form of quackery.

P. S.

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### WHAT ARE WAR BABIES?

That the machinery of life is a very complicated matter to-day is a saying that has all the tiresome earmarks which come from constant repetition, and that the thought of to-day is completely removed from simplicity is also an apothegm that we have heard repeated with the solemnity that presages truth. Occasionally in our readings we come across a subject that appeals to us on account of the ease with which we at once understand it, and great is our joy that our mentality is not called upon to indulge in snarls and then work hard at unravelling them in the hope of



reaching complete enlightenment. Such was our feeling when we first read of war babies in our medical journals, in the literary weeklies and monthlies; but it was not long before the content and peace of our simple way of thinking were completely destroyed, for though the first article which came to us was understandable, the others which followed in quick succession soon told us that our first thoughts must be crushed, otherwise we would be in a state of dire ignorance in connection with this problem. Of course, the first article we read had a deal to do with the unconventional behavior of the German army in Belgium, as reported in the Press; and with some knowledge of human nature we could easily conceive of the fact that an invading army is not any too careful of the code of morals. So the picture that was presented to us was that of a new race in Belgium with decided Germanic traits, and unhappy and disgraced mothers; and our sympathy and interest were fully aroused that this plunge into wickedness had obtained in our day and that the laws of eugenics, so carefully nurtured in the last few years, had been laughed at and scorned and mocked.

But the problem of war babies has outgrown the swaddling clothes with which our mental simplicity had hampered it, and at present it is inclusive of so many babies that we are quite sure, directly the European war is over, the number will be quite formidable. We read that English soldiers in training are not conducting themselves on puritanic lines, that hasty marriages are encouraged in Germany, England and France, so that the child to be born,—the inference always is that it will be a male, a belief that has never been satisfactorily explained,—will take the place of the father in case he is killed at the front, and that the 'one-child' households of those married men, who for one reason or another have not been called to the colors, are being held up to obloquy by the Press and the Governments of the belligerent countries in the hope of a decided increase in births. Hence it can readily be understood by the reader how vast this subject is to-day: its ramifications into all walks of life, its concomitant attacks on what was heretofore thought to be an invincible moral code, its meaning not only to Europe but to the United States; for it cannot be gainsaid that through the kindly offices of well-meaning but short-sighted men and women a large number of prospective mothers will be induced to come to this 'free' country to begin life anew and add incidentally to our already large number of illegitimate births and the crowding of our foundling institutions that are without exception unsupported by the state. And in the train of the women who are victims of the war will be hundreds, perhaps thousands, of others who will avail themselves of the opportunity to receive succor at a time when the powers of differentiation, which benefactors should always exercise to decide between the

deserving and the undeserving, are swamped in oceans of sympathy on account of the rhetorical efflorescence that is the usual decorative accoutrement of articles hurriedly written with no other thought than to attract attention by their hysterical outbursts.

So again we ask, What are war babies?

P. S.

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### LITERARY NOTES.

Ford Madox Hueffer's "When Blood Is Their Argument" (George H. Doran Company, New York) is a book that will bear rereading, not once but many times, for crowded into its pages are many nuggets of truth, of criticism of the unprejudicial sort, and of a deep and wide understanding. Added to these good points the setting is brilliant, so brilliant, indeed, that the reader must be a dullard and devoid of the right appreciation of what constitutes a literary style of a high order, perspicacity, and mastery of subject, to cavil at minor defects. Books about Germany abound at the present time, but most of them are written by men and women who have only a superficial knowledge of the subject. They are either too kindly or too vindictive and acrimonious, and no matter whether they are the one or the other, their outstanding quality as real literature is decidedly below par. Not this book of Hueffer's for this class of so-called instructive books, but for a class apart, and one that is rarely reached by a modern author. When a writer has read so deeply into his subject as has this Englishman of German descent,—his maternal grandfather was Oliver Madox Brown, the English painter, and his paternal grandfather a German by birth and musical critic on a great London newspaper,—and has had the benefits of an education in Germany and rare opportunities to study the customs and the history of its modern philosophical, military and literary trends, aided by a mind that can get at the right equation on account of its sense of humor, its humanities and its correct judgments, we have one who is just the right sort to enlighten us on questions the inept newspaper correspondent and the equally inept writer in magazines have muddled beyond the comprehension of the most intelligent reader. From beginning to end this work holds the reader, not by a leash so thin that it can be easily broken, but by a tether of enough resiliency to draw him back again and again to its fascinating pages. And of all the fascinating pages, the most irresistible are those devoted to Two Further German Figures (Wagner and Nietzsche) and German University System.

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It can be said with considerable truth and a prescience that cannot be questioned, that from now on Belgium will be the topic of controversial books, of poems and of plays: some bad, some indifferent, and a very small number characterized by outstanding qualities. In the last class Leonid Andreyev's "The Sorrows of Belgium" (The Macmillan Company, New York) must be placed, for written large across its pages are the sincerity, the acumen, the insight of an exceptional mind that can get at the root of the

feelings, the sentiments, the thought of a people, with a directness that is completely foreign to circumlocution and bombast. The Russian's tragedy is a tale of sorrow and misfortune, of the horrors of war as they must come home to a law-abiding and peaceful nation that has lived the quiet and unostentatious life that comes from content. Ruthlessly to disturb a kindly and in-offensive nation from its sense of security and thrust it into a war for which it is wholly unprepared, is the sort of tragedy that is not followed by tears but by hysterical laughter; and when Jeanne says to her husband, Emil Grelieu, who by the way is intended by the dramatist to be Maeterlinck, "It makes me laugh—it seems so comical to me that they mistake us for rabbits," and the Peasant says later on, in speaking of a girl who is wandering around aimlessly, "You cannot catch her. She asked me, too, about the road to Lonua. She is insane. (Laughs) There are many like her," we have the mental state of a driven people who no longer can draw the line between tragedy and comedy. We would commend this moving drama to all, on account of its great appreciation and understandingness of the sentiments of folk of common clay and of those whose clay is somewhat better, due to the elevating effects of education, but who when they are plunged into an abyss by disaster think just as the common people do, which is natural, and just as it should be. And this truism Andreyev handles in masterly fashion.

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In reading Masefield's appreciation of Synge, the Irish dramatist whose untimely death is still a matter of regret among those who appreciate literature, one is moved to the thought that the friendship which existed between these two men was of a nature that would bear imitation. When Masefield first met Synge, the latter's well-known taciturnity was as usual in evidence, and beyond a formal greeting he had nothing to say to the English poet. But succeeding visits soon developed a more communicative spirit in Synge, and although he never completely shook off his diffidence and disinclination to talk, the benign influence which his English admirer exercised over him led to an association that was both sympathetic and beneficial. The lines in the book *John M. Synge: A Few Personal Recollections with Personal Notes* by John Masefield (The Macmillan Company, New York) are enlightening in a number of ways, for not only do we get this side of Synge's character, but we understand at once why his plays are devoid of unnecessary words, of the old-fashioned pursuit of sensational effects, and finally why they are stamped with precision, clarity of thought, and are perfect expositors of the *mot juste*. Even though the reader has never seen any of Synge's plays acted, or for that matter has never read them, let him not hesitate to read this little book that tells so much of the Irish dramatist in a personal way. A splendid tribute from one genius to another is this; for it is written in the unaffected way that counts for much with all those who know that admiration and affection are expressed only in language whose hall-mark is simplicity.

P. S.



## ORIGINAL ARTICLES.

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### SOME MECHANICAL DERANGEMENTS OF THE KNEE-JOINT.\*

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The knee-joint is exposed to tremendous leverage because of its situation between the two longest bones in the skeleton. Mechanically it is constructed so there are practically no bony prominences to strengthen it, thus forcing the ligaments to be the main strength of the joint. It acts as a hinge except at the end of extension, when a screwing inward to a slight degree of the femur on the tibia is permitted. The joint is most stable in full extension when all the ligaments are taut. While the leg is being flexed the joint is a little less stable and very slight abduction, adduction or rotation is possible. This slight instability is present to varying degrees up to a right angle; after this it lessens. Considering the apparently poor mechanical arrangement of the articular cartilage and bony surfaces of this joint, it can at once be seen that an extraordinarily efficient ligamentous reinforcement is necessary and such is indeed provided. A brief description of these ligaments is as follows.

In front is the anterior or big patellar ligament, but as this has a ligamentous or tendinous attachment below and a muscular above, its action as a true ligament is not very great. On the inner side is the internal lateral ligament described as short, strong and fan-shaped with the narrow part downward. Its deep portion is intimately associated with the capsule and necessarily then with the internal semilunar cartilage. Its deep fibers are short, thus keeping the internal semilunar close to the condyles of the femur. On the outer side is placed the external lateral ligament, composed of two parts, a weak posterior and a strong anterior. This ligament extends from the external tuberosity of the femur to the head of the fibula, splitting the tendon of the biceps in its course. It is separated from the capsule of the joint by the popliteus tendon and the bursa found there. These two lateral ligaments are the chief agents

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\*Read before the Boston Orthopedic Club, April 11th, 1915.

providing against lateral mobility. The internal lateral prevents the knee from bending inward and the external lateral from bending outward. The rounded ends of the femur are buttressed, as it were, by the internal and external semilunar cartilages, thus aiding the lateral ligaments in their function (Fig. 1).

The internal semilunar cartilage forms quite a large segment of a circle and is less movable than the external. Posteriorly it is firmly attached just in front of the posterior crucial. Anteriorly

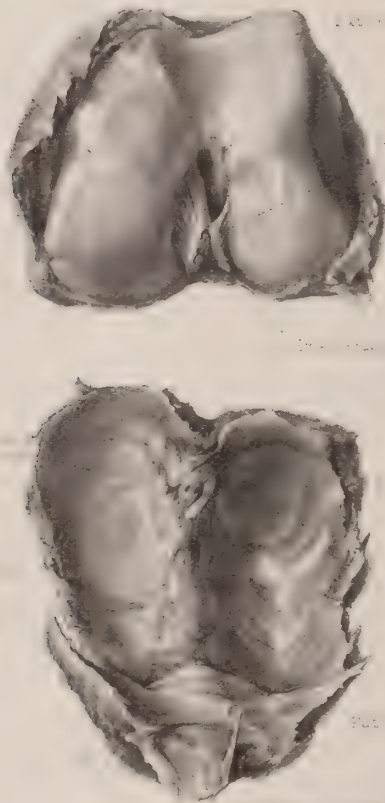


Fig. 1.—Intrinsic structures of the knee-joint.

it is less firmly attached just in front of the anterior crucial ligament. Internally it has a firm attachment to the lateral ligament and somewhat weak attachment to the tibia by the coronary ligament.

The external semilunar forms a smaller segment of a circle. Occasionally it is a complete cartilage as in the 3 out of the 150 specimens examined by Tenney,<sup>1</sup> there being in these only a small open-

ing against the tibial spine. The external semilunar is fixed anteriorly in front of the tibial spine, posteriorly to the tibial spine between the tubercles, giving a strong slip to the posterior crucial ligament. The attachments to the external lateral ligament and the tibia are very weak. Each cartilage assists the opposite lateral ligament in resisting the lateral movements of the leg, acting as a wedge between the tibia and femur which helps to make the crucials taut. These semilunar bodies are spoken of structurally as cartilaginous. They are in reality fibro-cartilaginous, the thick convex part being largely fibrous tissue, whereas the inner concave portion is cartilaginous. Injuries nearly always occur to this free cartilaginous border and small pieces of cartilage may become separated and loose. The fibrous tissue is arranged transversely and longitudinally. The longitudinal fibers may continue anteriorly across to the opposite cartilage forming the transverse ligament—an insignificant structure. At the convex borders, the transverse fibers blend with the capsule. The coronary ligaments are formed by these fibers below and are really only the portion of the capsule between the semilunars and the tibia.

The anterior and posterior crucial ligaments are two very important intrinsic ligaments. The anterior arises from the front of the spine near the anterior extremity of the external semilunar and courses upward, outward and backward to the inner side of the outer condyle. The posterior arises from the back of the groove at the posterior aspect of the top of the bone and from its outer border, leaving the floor of the groove and the transverse piece of the spine of the tibia free and covered by synovial membrane. Here it is closely connected with the external semilunar cartilage and runs forward, upward and a little inward to the front of the outer side of the inner condyle and of the intercondylar notch (Piersol).<sup>2</sup> These ligaments greatly aid in the stability of the joint. Griffiths<sup>3</sup> states that if the internal or external lateral ligament be divided and the lateral bending be attempted in the extended position, considerable bending is allowed, but if the same be attempted in the flexed position no bending is allowed laterally. He concludes, therefore, that bending inward of the knee-joint is prevented by the internal lateral ligament in the extended position and by the crucials in the flexed position. In flexion the relaxation of the internal lateral ligament allows of some rotation. A pull upon the anterior or upper part of the internal lateral ligament makes some traction directly upon the internal semilunar cartilage, and this may be responsible for the anterior extremity becoming ripped when caught and extension of the joint is attempted. Jones<sup>4</sup> says experiments show that hyperextension of the knee is prevented (1) by the posterior crucial, (2) by the anterior crucial, (3) by the internal lateral ligament, (4) by the external lateral ligament, and that increased extension is



secured as each of these is divided in turn. Internal rotation is limited by the internal lateral ligament and the anterior crucial. In external rotation the tibia may slip slightly forward on the femur but be stopped by the anterior crucial. On internal rotation the tibia may slip back a little but be stopped by the posterior crucial.

#### METHOD OF PRODUCTION OF INJURIES.

In this series of cases, I have taken into consideration only those of internal derangement due to injuries to the semilunar cartilages or to loose bodies having their origin in the joint itself. Foreign bodies introduced from without are not included. The method of producing these injuries is an interesting subject and is explained in various ways by different authorities. The consensus of opinion is that they usually occur with the knee a little flexed, the foot abducted and everted, thus tending to rotate the tibia outward (or the femur inward). The cartilage is ripped as extension is attempted. Martin<sup>5</sup> calls attention to the frequency of the occurrence among coal miners, standing as they do with the knees more or less flexed in low seams (4 ft. x 4½ ft.) in the mines. A forcible twist or wrench of the tibia on the femur while in this position tends to rip the semilunar cartilage. Walton<sup>6</sup> believes that injuries to the semilunar cartilages are brought about by a condition of hyper-extension of the knee. He says that sudden pain in the joint causes it to be more immediately flexed. The patient falls, and on attempting to rise finds the knee is fixed in the semi-flexed position and believes that the accident occurred with the leg in that position. Jones<sup>7</sup> says the most frequent cause of injury to the internal meniscus is strain thrown on the internal lateral ligament while the knee is flexed and the tibia rotated outward. In rare instances he has known it to occur with the knee extended. Certainly the histories of cases in our clinic have in the majority of instances brought out the point that the leg was flexed a little, the foot abducted and force applied which caused the tibia to be rotated outward or the femur inward, depending on whether the twisting force was applied above or below the plane of the knee. In some, the records were not clear on this point, the patients themselves not remembering just how the injury was produced. The loose bodies in some instances seem to have originated from direct trauma. The method of production or formation of these loose bodies is not exactly clear, and it may be well to consider briefly their character.

Koenig,<sup>8</sup> in 1887, described osteochondritis dessicans as being the result of blocking the nutrient end artery supplying the part in the condyles of the femur. Barth,<sup>9</sup> in 1896, disputed this, believing that arthritis deformans and trauma were the only two modes of formation of loose bodies of chondral and osteochondral nature. The typical fibrinous bodies are thought to be due to degenerative

changes in the synovial membrane and occur in tuberculosis and Charcot's joint. Do these fibrinous bodies develop into cartilaginous bodies? Whitelocke<sup>10</sup> thinks they may, and explains the development on embryologic grounds. He states the development of fibrous tissue into cartilage is due to the fact that the early development of the synovial membrane, articular and interarticular cartilages of the knee-joint are all from the same primitive embryonic intermediate layer of the axial blastema. This would indicate that Whitelocke does not favor the view of Koenig as to the origin of these pieces of cartilage. I have seen one case—a young man who had a piece of cartilage firmly embedded in the cartilaginous surface of the femur. According to Whitelocke this may have originated in a tag of synovial membrane becoming cartilaginous, wandering about and finally embedding itself in the cartilage of the condyle of the femur. To free this piece it was necessary to cut along its edges and lift it from its bed. Clinically, it hardly seemed possible that this piece could have originated elsewhere than from the condyle of the femur. The articular cartilage of the femur is thickest over the trochlear surface on which the patella slides. It is also thickened along the curve of the condyle over the area in contact with the tibia. In this latter area the loosened piece of cartilage was found.

#### EFFECT OF LOOSE OR FREE BODIES.

The primary effect of loose or free bodies is mechanical, chiefly by obstruction of motion and secondarily causing irritation and effusion. Lane<sup>11</sup> makes the statement that the large majority of tuberculous infections of the knee-joint originate in the local depreciation of vitality resulting from damage to the internal fibro-cartilage. He does not hold that the site of the tuberculous infection is in the fibro-cartilage itself, but that the mechanically produced inflammation of the joint causing effusion and inflammation of the synovia may afford the nidus for the infection. Jones says: "An argument in favor of operation is the occurrence of tubercle and so-called rheumatoid trouble as a direct result of the irritation of a displaced cartilage." The irritation produced by these loose or free bodies is chronic and characterized by acute exacerbations. In some, but certainly not in all, of our cases of tuberculosis of the knee there has been a suggestion of such a history. I might cite an interesting case in this series. A young man had a direct trauma resulting in marked restriction of motion and effusion of the knee-joint. The knee was aspirated, a clear serous fluid being obtained which was used in a guinea-pig test. In a week the joint was opened and a large osteochondromatous mass, which had been demonstrated by the Roentgen ray, was removed with a chisel from the region of the tibial spine. An uneventful recovery ensued. The

guinea-pig died in six weeks from extensive tuberculous peritonitis involving the liver and spleen. There is no reason to suppose that any error was made in the laboratory and Dr. Sanford says he has never known a guinea-pig to develop a spontaneous tuberculous peritonitis. Over a year has passed since the operation and the patient has now, to all intents and purposes, a perfectly normal functioning knee and is working on a farm.

#### SYMPTOMS AND INDICATIONS FOR OPERATION.

The subjective findings in these cases prove similar, as the histories are reviewed, but the objective findings vary according to the time since the last attack. A typical case of damage to the internal semilunar uncomplicated by arthritis gives a clear-cut history. The injury is most often indirect, perhaps during some not unusual exertion in which the mechanics of the knee-joint are brought into action. The most frequent history is that of an everted foot, abducted leg, and knee slightly flexed throwing stress on the internal lateral ligament. In the act of extension the movement is blocked by the interposition of the cartilage, severe pain is felt and the cartilage may be fractured. If the fracture is reduced at once and the leg held in extension and quiet for four or five weeks, there will be few cases of recurrence. Too often this is not done and the patient presents himself after many attacks with considerable effusion and perhaps an arthritis.

There has been considerable discussion in the past as to whether the arthritis is a precursor or an end-result of the loose cartilage or free body. A loose internal semilunar scarcely seems sufficient cause for arthritis, but on the other hand a pedunculated or free piece of cartilage might be an exciting cause for an arthritic joint, were the arthritis actually produced by a mechanical agent. We do not know the exact cause of the arthritis. If infectious, the cause may be explained by the theory that the chronic irritation produced in the joint by the loose or free cartilage lowers the normal resistance and devitalizes the entire intra-articular lining, providing a possible nidus for infection. It is quite possible that in many of our older patients the free cartilaginous bodies may have had their origin in the arthritis. Lack of extension or 'locking' and the consequent pain are the most constant symptoms, but are not invariably present. Effusion is quite constant but may be so slight as not to be noted by the patient. Generally speaking, a frank pinching of the internal semilunar produces more effusion than the locking by a free body. This is especially true if an actual fracture of the internal semilunar is produced. A differential diagnosis between a loose internal semilunar and a loose or free piece of cartilage is not always possible. Roentgenograms are our most valuable aid in these cases. The semilunar cartilages do not as a



rule cast a shadow. They are composed of fibrous tissue and white cartilage, whereas the free bodies are often osteochondral in character and have sufficient bony deposits in them to cast a definite shadow. On the other hand, a semilunar cartilage which is loose may through irritation have sufficient calcium deposited in it or become thickened enough to cast a shadow.

The patients' statements must be carefully considered and weighed. They often say that they have felt the body to the outer side of the joint or above the patella. This, of course, does not exclude a loose internal semilunar, but it does tell us that there is something besides a loose internal meniscus. In the past, the internal semilunar has been given the excess of treatment allotted the appendix in abdominal surgery. The internal semilunar cartilage should be removed only when gross lesions are present or the history is so clear as to leave no doubt. Jones admits that he has sometimes had to close the knee-joint without repairing or removing anything after having made a careful search for a pathologic reason for the symptoms.

A just balance should be maintained between the clinical and pathologic findings. It is perfectly possible to conceive that between attacks of locking, the cartilage would present relatively little pathology. When a semilunar cartilage is not fractured, or not more than normally movable or thickened, it should not be removed. In America, the literature upon this subject is quite scanty. Certainly the number of knee-joints opened is very much smaller than in England. Whether they are not diagnosed here or whether they are not as common in America is a question. I am inclined to think the latter true. Orthopedists have long recognized that the results of knee surgery are not as good as they should be and have wisely been conservative. Clinical impressions are a poor basis for clinical diagnostic rules.

With the idea of establishing for myself some definite basis for judgment, I began this study. In the Mayo Clinic (January 1st, 1910 to January 1st, 1915) 63 knee-joints have been opened for damage to the internal semilunar or a loose or free cartilage. In no instance was a damaged external semilunar found. The results in these cases were not all that could be wished. Most of the patients have been seen or have written, giving 52 cases on which to base conclusions. Statistics in such a small group or in any sized group are apt to be erroneous. Operations were performed with practically the same technique. The questions confronting us are, Did we cure, relieve or fail to relieve the patient?

In 60 cases, Finch<sup>12</sup> reported as follows: "In 40, the patients were pleased with the results; in 9 the results were fairly successful, and in 11 not satisfactory." This in the main coincides with our statistics. A careful review of these cases has led me to be-

lieve that the majority of the patients not cured or believing themselves not sufficiently alleviated to justify the pain, inconvenience and expense of the operation, there was an associated arthritis which might account for the poor result. Associated with the loose cartilage may have been extensive trauma to the ligaments causing an irreparably unstable joint. These patients had expected too much, an element which cannot be incorporated in our statistics and makes our figures appear even worse than they actually are. However, in summing up, these facts have influenced me very little.

In the entire series of 63 patients there were 7 between the ages of fifteen and twenty; 26 between the ages of twenty and thirty; 12 between the ages of thirty and forty; 11 between the ages of forty and fifty; 5 between the ages of fifty and sixty; and 2 between sixty and seventy. Fifty-two were traced and of these 30 may fairly be called cured, whereas 22 did not on the whole have satisfactory results. Expressed in percentages we find 62.5 per cent. cured, 26 per cent. distinctly relieved, but 11.5 per cent. unrelieved. This closely approximates Finch's statistics. Investigating these poor results a little more closely I find that in 6 cases they cannot be excused on the grounds of associated arthritis, trauma or poor history. I must conclude, therefore, that the trouble was not located at operation or that the joint was weakened in some way by the operation, *e. g.*, cutting the internal lateral ligament in our attempt to get exposure. The internal semilunar alone was removed in 33 cases, and in 7 together with a loose or free piece of cartilage. In 12 cases a loose piece of cartilage only was removed, the internal cartilage being left unmolested. The poorest results obtained were those in which the internal semilunar and possibly a fat tag were removed in the search for pathology to account for the symptoms. In our experience the fat tag has very seldom seemed to be the offender. When cartilage or fat tags were removed only where definite pathology was found, the results were good. The internal semilunar is needed to strengthen the joint and if removed is in a measure replaced. In several cases where we have had to explore the joint for some other cause after the removal of the internal semilunar, the space was filled by a firmly fixed fibrous tissue not as large as a normal cartilage, but large enough to be of some help in maintaining the stability of the joint. An associated arthritis in elderly people should not deprive them of the benefit of the operation if there are free bodies or if the internal semilunar is definitely loose or fractured. These people should, however, be told that the operation will relieve the mechanical difficulties but not the pain, stiffness and lack of motion consequent upon arthritis. Unless this is explained they expect complete relief and are naturally disappointed. Arthritis in a young person, consequent on the

mechanical irritation of a loose cartilage, tends after removal of the cartilage to improve and may completely disappear.

There was no mortality in this series. Two patients became distinctly worse after operation. One was a woman with associated destructive arthritis in which the internal semilunar seemed to be the prime offender. At the time of operation there was no joint fluid present. Removal of the semilunar did not help the condition. The destruction continued and the joint was resected with relief. Bacteriologic tests did not confirm a diagnosis of tuberculosis. In another patient, a young man with an atypical history, a dry arthritis was found at operation. Though no fracture was found, the internal semilunar was removed, since it seemed rather loose and thickened. A mild infection followed and still persists a year after operation. The joint is slowly stiffening. I believe the arthritis was in a process of development at the time of operation in both these cases and the joints should not have been opened. Such cases should not be operated upon.

The operative technique is briefly as follows: There is no preparation of the operative field except thorough washing with soap and water the day before, followed by alcoholic lavage. No water is allowed on the skin on the day of operation. Benzine and iodine preparation are carried out on the table as the patient is going to sleep. A tourniquet is applied. The head of the table is lowered slightly, and the foot-piece dropped, leaving the leg in flexion of about 70°. A curved incision is made along the internal condylar border (Jones) of the femur and the joint is opened, care being taken to avoid the internal lateral ligament. If the internal semilunar is to be removed, it is done usually with a pair of blunt dissecting scissors—the posterior end often having to be cut with a small bladed knife. The capsule is closed with a few interrupted sutures of chromic catgut, and the skin is closed with silkworm gut and horsehair. A posterior splint is applied and the patient allowed to be up on crutches in four or five days. The splint is removed in ten days and moderate active use advised. Weight-bearing is then permitted as soon as the patient wishes.

The following are a few rather typical histories with accompanying roentgenograms:—

CASE I, No. 83,674.—(X-ray No. 21,063.) Woman, *æt.* sixty. Two years before the patient sprained her left ankle and at the same time had a feeling of something snapping in her right knee. She had frequent attacks of sharp pain in her right knee when walking and for a while was unable to move her leg. Roentgenogram showed a loose cartilage in the suprapatellar pouch with hypertrophic arthritis (Fig. 2). Operation May 7th, 1913. The internal semilunar, which was dislocated and freely movable, was removed, and also a floating cartilage one-third inch in diameter, evidently moved down from its former position between the condyles. Complete recovery followed, showing that age in itself is no contraindication to operation.



CASE II, No. 78,990.—(X-ray No. 18,913.) Man, *æt.* thirty-two. For eight years the patient complained of painful locking followed by effusion. The last attack occurred two weeks before the operation was performed and was especially severe, suggesting a loose internal semilunar. The roentgenogram showed a floating cartilage, which was removed at operation (January 30th, 1913), as was also the internal semilunar (Fig. 3). Complete recovery followed.

CASE III, No. 106,288.—Man, *æt.* forty-six. The history in this case extended back thirty-four years and was characterized by catches of pain in the right knee not typical but suggestive of locking. At times a loose body could be felt. The patient stated that when bending his knee to sit down he could at times see something snap out at the inner side of the knee. Operation May 28th, 1914. Exploration of right knee disclosed the internal semilunar quite loose, one piece of free cartilage the size of a pea in the suprapatellar pouch and one attached cartilage about the same size between the condyles which were removed. The operation gave complete relief from all pain and inconvenience except that flexion is permitted but a little beyond a right angle. This is improving (Figs. 4 and 5).

CASE IV, No. 116,019.—Man, *æt.* twenty-four. He had a history of ten years' duration. For seven years soreness in the knee followed walking on rough ground. No swelling, no history of direct trauma were found. Three years ago he twisted his knee, heard something snap and had sharp pain over the region of the internal semilunar. Locking occurred and there was an effusion for three or four weeks. A year and again two weeks before operation the same thing happened. Operation October 1st, 1914. The internal semilunar was apparently normal and was not molested. A piece of cartilage the size of a five cent piece was found embedded in the cartilage of the internal condyle of the femur. It was firmly attached with flakes of fibrin about its edges and had to be cut free and lifted from its bed. This case seems to be one of osteochondritis dessicans recently described by Ridlon<sup>13</sup> and others (Figs. 6 and 7). The history suggests that this piece of cartilage becomes dislodged and floats about as a free body causing locking, later it floats back into its bed and becomes attached for a time.

CASE V, No. 97,040.—Man, *æt.* twenty-eight. There was a history of typical locking for twenty years following direct trauma to the inner side of the knee. Effusion never completely subsided. Roentgenogram showed two loose bodies in the joint (Fig. 8). Operation December 18th, 1913. An incision was made in the inner side of the knee. A loose body the size of a quarter and a little thicker was removed. The other body could not be located. The effusion persisted and also the locking. Another roentgenogram two months later showed the second body which was formerly in the posterior part of the joint in the suprapatellar pouch (Fig. 9). April 30th, 1914, the joint was again opened through the old incision, as on the operating table the body could not be felt to have moved from its position. A piece of cartilage the size of a quarter and three-eighths of an inch thick was removed, the semilunar was not touched. The man is now working as a stone mason with no inconvenience.

CASE VI, No. 108,373.—Woman, *æt.* sixty. The patient gave 'rheumatic' history of twenty years' duration in finger joints, etc. Treatment at Hot Springs had given temporary relief. Two and one-half years ago a typical locking of the right knee with associated pain and swelling took place. She had had several attacks with more pain and swelling in this joint. Roentgenogram showed hypertrophic arthritis with a piece of cartilage lying in the

*Henderson: Derangements of Knee-Joint*

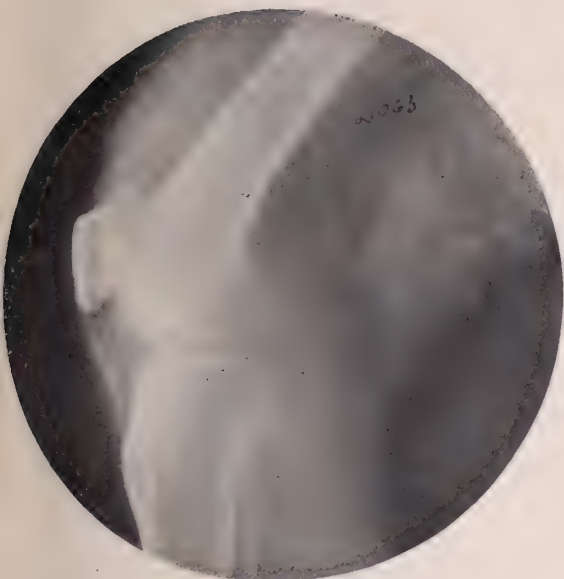


Fig. 2.



Fig. 3.

Fig. 2.—X-ray No. 21,063. Loose cartilage above the patella, which at operation was found to have moved down between the condyles. Considerable arthritis. Patient, aged sixty, obtained complete relief.

Fig. 3.—X-ray No. 18,913. Loose body. Free cartilage. Eight years' history of locking followed by effusion. Loose internal semilunar not shown in x-ray.



Fig. 4.



Fig. 5.

Fig. 4.—X-ray No. 106,288. Shows loose cartilage above patella and faintly one in the intercondylar space.

Fig. 5.—X-ray No. 106,288 (same as Fig. 4). Shows the cartilage between external condyle and tibia.

*Henderson: Derangements of Knee-Joint*



Fig. 6.



Fig. 7.

Fig. 6.—X-ray No. 116,019. Anteroposterior view showing portion of cartilage embedded in internal condyle of the left knee, causing locking, etc.

Fig. 7.—X-ray No. 116,019. Lateral view showing same as Fig. 6.



Fig. 8.



Fig. 9.

Fig. 8.—X-ray No. 97,040. Male, aged twenty-eight. For twenty years locking; always some effusion; two loose bodies in joint. The one between the femur and tibia removed at first operation. The other not located.

Fig. 9.—X-ray No. 97,040 (same as Fig. 8). Body in suprapatellar bursa was formerly in posterior part of the joint as shown in Fig. 2.



suprapatellar pouch (Fig. 10). Operation June 30th, 1914. Removal of free cartilage  $1\frac{1}{2}$  in. x  $\frac{3}{4}$  in. x  $\frac{1}{4}$  in. in outer and upper aspect of the right knee relieved the locking and swelling in the joint. There is less pain, but the patient still uses crutches nine months after operation. She is still suffering from the arthritis, but is free from the mechanical difficulties caused by the loose body.



Fig. 10.—X-ray No. 108,373. Female, aged sixty. Hypertrophic arthritis, twenty years' duration. Locking of the joint with typical symptoms for two and a half years. Loose body in the suprapatellar pouch.

#### CONCLUSIONS.

1. Surgery of the knee-joint in America, at least, is still in the developmental period. More clinical reports are necessary to aid in establishing definite procedures.

2. Internal semilunar or external semilunar cartilages should be removed only when definite pathology is present (*e. g.*, fractures, definitely loosened or thickened, and showing evidences of nipping or with such a clear history that there would be no doubt as to its culpability).

3. Loose or free pieces of cartilage should be removed with the least possible trauma. This can be done in some instances under local anesthesia, with, of course, the most rigid asepsis.

4. Small incisions and early use of the leg.

5. The curved incision along the internal condylar line is usually best. In certain selected cases, the splitting of the patella, as advised by Jones and more recently by Corner,<sup>14</sup> is an aid in the approach for certain loose bodies, but probably not the best for removal of the internal semilunar or routine knee surgery.

6. Patients, especially older people, having associated arthritis cannot expect to be relieved of their arthritis by operation, but are entitled to removal of the mechanical derangements when possible.

7. Under rigid asepsis and careful technique (more rigid than in abdominal surgery), there is practically no danger to life or limb.

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## DEFLECTION OF ENERGY.

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In this day of rush and hurry and extravagant expenditure of our vital forces, our body machines are frequently called upon to carry an overload. It is thus necessary that the mechanics, under whose care and oversight many of these machines are run, should have just as thorough a knowledge of all the working parts, and what load they should carry, as it is possible to get.

It is my wish and purpose in writing this article to call the attention of the general practitioner, especially, a little more closely to a consideration of the loss and waste of power in the human machines that come into their hands for repair or supervision.

Through the failure of most of our medical schools to teach us much about the active working anatomy, normal and abnormal, we have failed in getting a clear idea of the importance of ordinary anatomical functions. We have learned little about the weight lines of the various parts of the body, muscle balance, the proper relation during work of weight-bearing, of the various parts of joints, the difference between various types of individuals, *i. e.*, tall or short, thin or fat, male or female, in regard to the value of a correct posture, or the right therapeutic use of gymnastic exercises.

Usually in thinking of work and overwork, we only consider the kind, quantity, and the number of hours spent, without noting the fact that various parts of the body are working all our waking hours, and the work is not of the kind measured by a daily output. We need to realize that unless each of the separate parts of the body works in perfect balance and is kept properly aligned with the other parts, we cannot expect to overcome even friction and gravity alone without a loss of energy. How much more then will be lost if we have a machine trying to do eight hours' work with various joints out of line and the general body balance disturbed? Many a man, who is rather tired out and run down, goes to his doctor and is given a little tonic to whip up his flagging forces, and told that he needs more exercise. If he works indoors at a desk, he may decide to walk down to work each morning, a mile or so, which he does on a pair of flat feet, or legs that are rotated, with pronating ankles and feet, or, perhaps he buys a punching bag, and morning and night takes thirty minutes to an hour of bag punching, strengthening his pectorals more than ever, when he already has round shoulders, weak scapular and back muscles, which



have been stretched all day at the desk, and all night, while he slept on a sagging bed with his head thrust forward by a pillow.

Thus, instead of tending to balance the muscular condition, there is a greater weakening of the muscles, which are stretched, and exercises intended to favor increased tone, really are only added work to muscles already tired and weakened. Usually these very groups are the ones which are called upon to do increasingly more work, because the more the part lists and deviates from normal, the greater strain it bears. For instance, when back muscles weaken, the body droops and the erector spinæ group, acting as a check-rein, is stretched more and more as the trunk deviates. Thus work, that during normal activity would be handled with a minimum expenditure for a maximum result, must require a greater increase in expenditure for the same, or even a less result.

The same things are more especially noticeable in the feet and legs. In faulty positions the entire weight of the body thrusting down through the legs is often really supported on the ligaments and muscles and not on the bony column.

More specifically this: In a slight knock-knee, or a case with pronated ankles, the weight falling through from the anterior superior spine to the middle of the patella falls medialward, instead of falling through the ankle-joint, thus everting the foot and throwing a strain on the plantar and internal lateral ligaments.

This superincumbent weight being too great, the ligaments stretch, allowing the bones to drop. This deviation increases the strain and the weight is then transmitted to the tibial group of muscles, which have to carry this burden, over and above their normal load, thus forming a vicious circle. When soreness, mechanical friction, or pain are present, the attempt to control this by muscle spasm adds more to the burden.

As the foot deviates into valgus the leg rotates inward, puts on a tension the piriformis and other external thigh rotators which are attached to the pelvis and back. Thus, from the feet to the head, the various coordinating groups are over-taxed, with the result that aside from decreasing the efficiency, there is a large loss of energy and increase of waste.

This over-loading is manifested in many ways, but because it may not immediately give rise to pain, disability, or deformity, may go on for years, the machine gradually wearing out; decreasing resistance to infections; increasing the chance for function disturbances; robbing the nervous system of strength it needs for other work; over-taxing the circulatory apparatus, and generally upsetting the otherwise smooth reciprocation of its parts.

Speaking more definitely, some of these manifestations are as follows: Tiredness after an ordinary amount of work; a heavy leg weary feeling, especially from standing still; cramping in the

calves or thighs; backache, neuritic disturbances over the shoulders, arms, back or legs; increased nervousness and irritability; changes in disposition; and frequently accentuation of the symptoms of already existing functional disturbances. Local symptoms pointing directly to the difficulty may or may not be present: such as pain, swelling, soreness, aching, etc., in legs, feet, or back. Pain radiated or reflex occurs frequently, such as sensory disturbances over hand and arm in the various bursæ around the shoulder, also in feet and legs in various sciatic disturbances.

I do not wish you to infer that I think these various disturbances are definitely caused by faulty mechanics, but they are symptoms alluded to by patients in their histories, which entirely or in part, clear up under treatment aimed primarily to correct the static situation and reestablishment of muscle balance. This I think is largely brought about by decreasing the overload, and stopping the leaks, saving force and vitality, which was deflected from its normal channels by the insistent and incessant demands of the overworking parts of the machine.

The following case records will serve to illustrate more clearly the points above mentioned.

CASE I.—Mrs. F. H., *æt.* thirty-four, weight 135 lb. March 14th came complaining of her feet. Family history negative.

*Past History.*—Had backache continually ever since college. Osteopathy last summer relieved somewhat.

Present condition dates back two weeks. Feet began to redden near the great toe joint. Back has been weak for the past ten or twelve years. "Gets tired very easily and back aches here" (pointing to lower back and sacro-iliac area). Has to sleep on her face, or with a pillow under her back. Getting progressively worse. Menses very irregular and painful; back condition very much worse at that time.

*Examination.*—Patient well nourished. Relaxed posture, slight right dorsal left lumbar scoliosis. Left shoulder high. Posterior superior spine on the right one-half inch lower than its fellow on the opposite side. Measurements: Episternal to inner malleolus, right, 49.5, left, 50. Episternal to anterior superior spine, right, 18, left 18.75. Leg lengths equal. Hip tests negative. Leg test negative. Bending test negative. Very sensitive to pressure over both sacro-iliac joints and somewhat in the lower lumbar vertebræ. Some inward rotation of the thighs. Ankles pronated. Moderate flattening of both anterior and posterior arches. Slight callosity along the inner border of the foot and beginning mild hallux valgus.

*Treatment.*—Regulation adhesive strapping and padding with prescription shoe, the heel of the right side being raised one-half inch. Later, corrective corset and arch plates, followed by corrective gymnastics. Duration of treatments a few days less than two months.

*Result of Treatment.*—May 3rd reported normal menstrual period, which came unawares at the correct time, with no pain or backache before, during, or afterwards. A letter from her a year later reports that she is still keeping up her exercises, has practically been normal, without any recurrence of symptoms.

*Comment.*—Note that all this patient came for was because of redness over the first metatarsal and was afraid that she would develop a bunion.

CASE II.—Dr. A., March 9th, 1914. Formerly dentist. Referred by his doctor for pain and ache in the lower back. *Aet.* fifty-two, weight 158 lb. Family history negative.

*Past History.*—Typhoid about thirty-six years ago. 'Sciatica' for past three or four years, "pain back of the hip and running down the back of the leg" (patient pointed to the sacro-iliac joint). Has always called it rheumatism. Has been to Arrowhead Hot Springs for a month or two at a time. Some relief but not permanent. Has been very nervous for the past two or three years. Has had several osteopathic treatments without results. Has to favor himself some in moving, especially in bending and twisting. Tires easily on standing. Says it seems good to have the back held up. Movement aggravates and rest improves the condition.

*Examination.*—Posture relaxed. Plumb line falls to the left of the nates one inch. Pelvis tilted to the left. Measurements: Anterior spine to the malleolus, right 33.5, left 33.25. Anterior spine to the ground, right, 36.37, left, 35.62. Umbilicus to anterior superior spine, right, 6.5, left, 6. Episternal to the anterior spine, right, 21, left, 21.5. Straight leg tests, right leg, rigid, left, less so, elicits no pain. Prone lying, right posterior spine lower than the left. Forward bending free. Left bending fair. Right bending freer. No pain elicited and no spasm. Marked inward rotation of the thigh. Marked pronation of the ankles. Moderate depression of both arches. Very slight swelling and congestion. Both feet flexible but not painful. Examination by the x-ray shows abnormally long lateral processes of fifth lumbar impinging on the lateral mass of the sacrum. Also shows the deviation of the long axis of the sacrum from the normal weight line.

*Treatment.*—Active treatment from April 9th to May 25th, 1914. Orthopedic shoes with the valgus wedge in the inner border of the heel; one-fourth inch raise. One-half inch pad in the right shoe to change the body poise. Feet strapped and padded with adhesive and felt for a few weeks, followed by arch plates.

*Result of Treatment.*—Within three or four weeks patient received relief from the symptoms. Has reported several times since for plate adjustments and shoe corrections and reports that he is still free from all symptoms, and that nervousness has all gone.

*Comment.*—You will note that there has been no treatment for the back, with the possible exception of general gymnastics.

CASE III.—Miss B. W., occupation, clerk, *æt.* thirty-three, weight 127½ lb. September 10th came complaining of her feet.

*Family History.*—Father died of tuberculosis; mother died of diabetes.

*Past History.*—Measles. Pneumonia at eight years and again three years ago. 'Rheumatism,' especially in the hands and arms, for the past two years.

*Present Illness.*—Feet have given her trouble for many years, especially since she started to work. Shoe store plates have given her some relief. Most of the trouble is with the great toe joints. Has cramp in the feet and toes. Tired achy feeling in the legs. Back tires easily and has some menstrual cramp and backache.

*Examination.*—Very relaxed posture, slight list to the left. Scapulæ prominent and wide. Pelvis slightly tilted to the left. Thighs and knees rotated inward. Valgus position of the feet with pronation and extreme depression



of the front arches. Moderate depression of the long arches. Extreme hallux valgus. Very inflamed and sensitive bursæ. Thick heavy callosities under the heads of the metatarsals. Feet and legs congested and swollen; very painful but flexible. Measurements: Anterior spine to the malleolus, right, 34.5, left, 34.75. Episternal to the malleolus, right, 18.5, left, 19.5.

*Treatment.*—October 28th operated for hallux valgus. Good results. Followed by strappings and pads with massage of the feet and legs. Orthopedic shoes followed by foot exercises, correct walking, arch supports, and general corrective exercises.

*Result of Treatment.*—February 17th treatment discontinued. Reports a gain of 16 lb. in weight. General condition very much improved. Less backache. Returned September 3rd, 1913 for new plates and change of shoe prescription. Reports that during the past year she has been better than for a number of years.

CASE IV.—Miss J. C., nurse, æt. twenty-three, weight 145 lb. January 26th, 1912, came complaining of her feet. Family history negative.

*Past History.*—Typhoid at thirteen. Ankles swelled up afterwards. During girlhood had weak ankles. Fourteen months ago had appendicitis, later abdominal operation, right ovary removed.

Present condition dates back a little over a year, when she entered the hospital to begin her training. At that time her arches broke down, feet were painful. Cramps in the legs and thighs. Marked backache. These symptoms are all progressive. At present she is hardly able to get around. Is nervous and irritable. Says her disposition is not what it used to be. Feet swell every night. The pain in her back is down low, and cannot lie on her back without one leg being drawn up. Has to sleep on her left side, frequently puts arms under back for support. Condition is worse after hard day's work. Had backache after both operations.

*Examination.*—Weight line lists a little to the left. Marked knock-knee. Measurements: Anterior spine to the malleolus, right, 34¼, left, 34½. Umbilicus to the inner malleolus, right, 38.5, left, 38.25. Episternal to the malleolus right, 19.25, left 18.25. Sensitive to pressure at the left of the third dorsal, at the eleventh and twelfth dorsals and first lumbar, over sacro-iliac area—on both sides, especially the sciatic notch. Advised to have regulation foot treatment for the arches and a corrective corset with pelvic and abdominal support for the body.

*Treatment.*—Had three foot strappings with adhesive and then plates were fitted. Two weeks later, when asked about getting the corset, she said she didn't see the use of getting it because the pain was all leaving her back.

*Result of Treatment.*—June 29th reported that she was feeling fine. Had an occasional slight backache, otherwise was very well, and had gained 8 lb. in two weeks. Has had no pain in her legs or back. Nervous symptoms have all cleared up.

CASE V.—Mrs. F. A., housewife, weight 180 lb., and gaining. May 6, 1913, came complaining of her feet. Family history negative.

*Past History.*—Negative.

Present condition dates back four years. Pain started in the knees and traveled down the legs to the arches, both dorsal and plantar aspect. Feet and legs swell. Very sensitive to pressure in the hips and back. Has considerable backache, much worse during the menstrual period. Very constipated.

*Examination.*—Pronation of both legs. Considerable depression of both arches. Hallux valgus and callosities. Marked swelling and congestion. Considerable edema of both legs, which at subsequent times was marked enough

to make the skin tight and shiny. Could be pitted to the depth of from three-eighths to one-half of an inch. Sent to specialist for kidney and bladder examination. Urinalysis showed no albumin, slight acidity and practically negative in other phases. Microscopical examination of urine showed a few leukocytes, many epithelial cells, a few cocci and bacilli, and two nests of tubercle bacilli, which were positive. Physicians unable to give any definite cause for the edematous condition of the legs.

*Treatment.*—Regulation straps of adhesive and felt pads for six weeks. Within three or four weeks swelling began to disappear in the legs. Reports that she is very much more comfortable and that she has had the first painless menstruation in fifteen years. Plates adjusted and corrective exercises given. October 8th, came for plate adjustment. Reports that she is feeling much better in every way. Is beginning to have normal bowel movements for the first time in many years. Referred to Dr. D. for bladder examination, as she was having some symptoms. He reports that the cystoscopic examination shows no sign of tubercular condition. September 6th, very much better. Bladder condition improved. September 29th, still improving. Very enthusiastic over the result. Her back still bothers her a little and advised her to have corrective corset. February 25th, 1914, came for new plates. All signs of swelling and edema have disappeared from the feet and legs. Gets around very comfortably. Looks and feels better than she has for years.

CASE VI.—J. A., boy of eleven, weight 60 lb. Complaint, feet. Brought by family physician, who said he thought the boy had chorea with possibly a tubercular ankle. Child was so nervous that the mother requested this doctor to come with them, as he had the boy's confidence.

*Family History.*—Father died of tuberculosis.

*Past History.*—Two years ago had scarlet fever; following winter, measles. Suffered from stomach disorder, and also ran a nail in his foot. They said, "The poison went all over his body and his joints were swollen."

*Present Condition.*—Some weeks previous was taken to a doctor, who was formerly the family physician, who looked him over, shook his head dubiously and said: "Take him to the country at once." This alarmed the mother, so she took the boy to Dr. K., who brought the boy to me. Present illness dates back to July in the present summer, when they said he had another attack like chorea. Has been excessively nervous and has attacks like convulsions. Hands tremble so he can scarcely lace his own shoes. Has been losing weight, appetite, erratic. Irregular and disturbed sleep. Doesn't like to play with the other boys. Is very timid and nervous. They have noticed that his ankles bulged in for some time, but recently there has been a marked swelling around the inner ankle bone.

*Examination.*—Very relaxed posture. Round shoulders. Prominent scapulæ. Flat chest. Legs rotated in. Inward rotation of the knees. Prominent condyles. Bad valgus position of the ankle bones, and arches depressed. Leg lengths, right, 31.25, left, 31.75. The sheaths of the tibial tendons are full of fluid, distended and extremely sensitive to pressure below the malleolus. Moderate amount of spasm in attempting to invert the foot. Feet temporarily strapped with adhesive.

*Treatment.*—Adhesive strappings continued for several weeks and plates fitted. Corrective shoes prescribed with a raised heel under the short leg. In December reports that improvement has continued. Mother states that he has not had any nervous attacks since the second strapping of the feet and that he has gained 8 lb. His appetite is improved and is beginning to sleep well. During next three months was put on all over-corrective gymnastics, with continued improvement. July, 1913, came in for new plate

and plate adjustment. Mother says he is just a normal everyday boy. All his old nervousness and timidity have gone and he plays normally with other children, eats like a farm hand and is growing rapidly.

*Result of Treatment.*—April 7th, 1915. Mother brought the boy in for observation and consultation about his plates. Has grown several inches in height and weighs 97½ lb. Has not had any return of former symptoms. Has caught up another grade in school. Never has any loss of sleep, and as far as the mother can tell he is absolutely normal. Heart condition is very much improved. Walks well, weight carried on the outer borders of the feet. Slight tendency to valgus on the right side. Mother very enthusiastic and grateful for our having taken him in hand when we did.

*Comment.*—This case illustrates very markedly the fact that the amount of nerve strain due to the over-working of the various groups of balance muscles, plus the local strain and irritation in the joints of the feet, probably due to some form of arthritis, was sufficient to disturb the nerve balance to such an extent that various functions could not be carried on properly. His response was so immediate, so rapid and continuous that, to my mind, there is no question but that the improvement was all brought about by saving for use in other channels the vitality which was being wasted.

CASE VII.—Miss M. B., June 3rd, 1914, *æt.* sixteen and a half, weight 102 lb. Second year high school.

*Family History.*—Negative.

*Past History.*—Normal as a child, but grew rather rapidly. Never particularly strong. Has always been well. Has not menstruated.

*Present Illness.*—About four years ago noticed that back was not symmetrical and that she was very much relaxed. Tires rather easily. Catches cold frequently. Is troubled with constipation and biliousness. Has poor circulation.

*Examination.*—Very relaxed posture. Rather round shoulders. Left functional scoliosis. Inward rotation of the thighs. Slight prominence of the inner condyles of the knees. From the anterior spine to the ground, right, 37.75, left, 38. From the spine to the malleolus, lengths equal. Moderate pronation. Moderate depression of both arches.

*Treatment.*—Correction of foot, leg and body posture. Corrective gymnastics. Corrective corsets.

*Result of Treatment.*—After three months of treatment began to menstruate. Mother reports improvement in her general posture. Does not tire so easily. Not so nervous. Takes her exercises in good form, making good correction. On December 23rd, 1914, mother reports that menstruations are rather irregular, but that her elimination is very much better. She is less awkward in all her motions. Has fewer colds. Feels warmer and in general is very much better in many ways. Pronation less marked and the anterior posterior gravity line improved. She is gaining steadily in weight and is feeling fine.

*Comment.*—The first point of interest in regard to this case is that there were no very serious symptoms, but she represents a very common type among growing school girls. The effect on her general health has been one of the most marked things about her



improvement, although no special effort has been directed toward conditions influencing her circulation.

These case records show clearly the points I wish to emphasize, but let me suggest that in order effectively to get a line on the question as to where the points of leakage are, patients must be stripped completely for examination and the body mechanism looked over.

I am writing this as a plea for more careful examinations, to lay stress on the importance of correct posture and its relation to health and efficiency, and also as a suggestion that we should not try to explain all the patient's symptoms pathologically.

## NYSTAGMUS.

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By I. D. KELLEY, JR., B. S., M. D., of St. Louis.

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*Definition.*—Nystagmus is any unusual motion of the eyes, but nystagmus of a vestibular origin may be defined as a rhythmic motion of the eyes, consisting of a slow and a rapid component.

*Anatomy.*—The internal ear descriptively is divided into the pars superior and pars inferior, the last mentioned division containing the end-organ for the perception of hearing, while the first, the pars superior, comprises the vestibular, or, more properly speaking, the semicircular apparatus, which will be dealt with particularly.

The pars superior is composed of the following anatomical structures: The three semicircular canals, the canalis semicircularis superior (frontalis anterior), canalis semic inferior (sagittalis posterior), canalis semic lateralis (horizontalis media). These canals connect with the utriculus by five openings: The lateral canal by two (ampullar and non-ampullar end); the superior and inferior by three openings (ampullar end of superior, ampullar end of inferior, non-ampullar ends of both, by a common opening). Each canal has its ampulla, containing the crista ampullaris, composed of the membrana propria, the cupola and the hair cells. From the crista ampullaris the nervus ampullaris passes to the internal auditory canal where these fibers are interrupted within the ganglion vestibular. The centrally directed vestibular fibres enter the brain stem and divide into ascending and descending branches. The descending branches form a descending vestibular root and end within the nucleus nervei vestibulara spinalis, which extends as far as posterior column nuclei. The ascending branches end within the nucleus medialis as well as within the lateral Deiters' nucleus, and the upper Bechterew's nucleus. From these end-nuclei the fibres pass to the cerebellar worm as constituents of the tractus nucleo-cerebellaris. A part of the vestibular fibres pass to the roof nucleus of the cerebellum as constituents of the direct sensory cerebellar tract, giving off collateral fibres to Deiters' nucleus. The median nucleus is brought into relation to the superior olive by means of fibres, and perhaps fibres pass also to the formatio reticularis and to the thalamus. Deiters' nucleus gives origin to a fibre bundle which as the tractus vestibulo spinalis passes to the spinal cord; also from Deiters' nucleus the fasciculus longitudinalis medialis takes its origin, passing upwards (some fibres crossing)

dividing into ascending and descending branches. The ascending branches reach the oculo-motor nucleus establishing relations of the nuclei of the eye muscles one to the other; the descending branches pass the anterior column of the spinal cord. The exact course of the cerebral fibres is uncertain. It is supposed that they pierce the substantia reticularis in the region above the transverse fibres of the pons, going to the thalamus and thence to the posterior part of the parietal lobe. The cortical centre for voluntary motion of the eyes (the rapid component of nystagmus) has its origin in the gyrus angularis, passing through the cells of Monakow to the eye muscle nerve nuclei.

*History.*—The relation which the function of the internal ear bears to reflex conditions in other parts of the body, and especially to equilibrium, has not only been determined by the result of recent investigations, but dates back as far as 1828, when Flourens discovered that manipulation of the semicircular canals in the deaf caused disturbances of equilibrium. In 1861 Ménière described his classical case, that of a young girl who suddenly presented all the symptoms of a typical Ménière symptom-complex (deafness, disturbances of equilibrium, nausea, vomiting, etc.), and at whose post-mortem was found a hemorrhagic labyrinthitis. Kreidl, in 1887, experimented upon the statholith apparatus in lobsters, and Shaefer (1894) found no turning dizziness in animals devoid of semicircular canals. During the year 1901, Alexander and Kreidl found that the disturbances of equilibrium in the so-called 'dancing mice' were due to congenital anomalies of the semicircular canals. Goltz was the first to advance the theory that the semicircular canals were the organs of equilibrium, and attributed as a cause for this action the movement of the endolymph upon the hair cells. Ewald concurred with Goltz's theory and pointed out a second, or statholith, apparatus, dealing with perception of movements of the head and body, and this perception he calls 'tonus labyrinthus.' Mach and Breuer advanced the theory that the semicircular apparatus is the organ of perception of angular positive and negative movements of the head (3 axes), and that the vestibular, or statholith, apparatus controls the positive and negative vertical and horizontal movements (2 axes). Owing to these actions, Breuer calls this apparatus the 'static labyrinth.'

Among the more recent investigations dealing with the reflex relation between the vestibular apparatus and the eye manifestations of nystagmus we are indebted to Ewald for the fundamental physiological facts, and to Bárány, who stands as the foremost investigator both of the physiological and clinical aspects of this subject.

*Physiology.*—To produce a physiological stimulation, or irritation, of the vestibular apparatus, it is necessary to cause a 'molecular



motion' of the endolymph, as a streaming, swimming, turning, knocking, etc., to the nerve end-cells in the ampullar cupola, to the statholiths, and to Corti's membrane. This was accomplished first by Ewald (Fig. 1) in his classical experiment upon the semicircular canals in the following manner: In the bony canal (I) he made a hole, inserting a plug (A), causing a complete stricture of the membranous canal by blocking off its distal, or non-ampullar, end from the approximal, or ampullar, end, and the utricle. He then inserted a compression and aspiration apparatus (B), and found that by compression he caused the endolymph to flow toward the ampulla (C), thus producing a movement of the hair cells toward the utricle (II), and causing an active, more valued, or positive irritation. The reversal of this process (rarefaction at B) causing a flow of endolymph to the non-ampullar, or distal end (I) and a consequent movement of the hair cells (C) toward the non-ampullar end (I) caused an inactive, negative, or less valued irritation.\*

In the reflex manifestation of nystagmus there is observed a cortical and a vestibular component, and the relation of these two

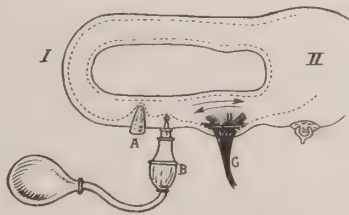


Fig. 1.—Ewald's experiment.

may be exemplified to the antagonistic action of the flexors and extensors of the hand. The cortical component arises from the voluntary cortical centres, while the vestibular component is entirely involuntary. From the direction of the quicker cortical component nystagmus is designated nystagmus to the right or to the left. When the vestibular apparatus is irritated, deep narcosis inhibits the cortical component and permits the eyes to remain fixed in the direction of the vestibular component.

Fig. 2 is a schematic drawing of the eyes with the adductor muscle nerve fibres ( $a^1$ ) passing from Deiters' nucleus of the right side (I) to the eye of the same side, and the abductor fibres ( $a^2$ ) passing to the eye of the opposite side. Also Deiters' nucleus of the left side (II) with adductor fibres ( $b^1$ ) to the same side, and abductor fibres ( $b$ ) to opposite side. Each Deiters' nucleus is connected with the ampullar end of the horizontal canal (C and D), and the non-ampullar ends are joined together.

\*The above action applies only to the lateral canal. The reverse action occurs when testing the superior and posterior canals. A flow of endolymph toward the non-ampullar end is the active, or more valued, stimulation.

To elicit the nystagmus reflex, the following tests are employed:—

*Turning Reaction.*—The individual is turned to the left a number of times. There is caused during the turning, at the beginning, a movement of the canals from right to left, but the fluid endolymph remains stationary, and the hair cells of the left ampulla are directed toward the ampullar end, producing the active, or more valued, stimulation, while the right ampullar hair cells are forced toward the non-ampullar end, producing an inactive, or less valued, stimulation. As a consequence of this action, the adductor muscles of the left eye and the adductor muscles of the right are stimulated, and a slow, horizontal motion of the eyes to the right occurs. The cerebral component now becoming active, draws the eyes back to their normal position by a quick, rotatoric movement to the left,

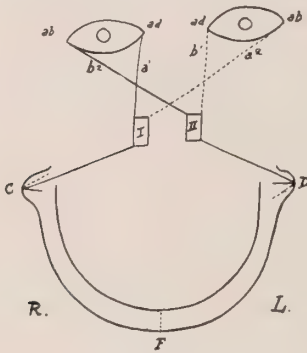


Fig. 2.

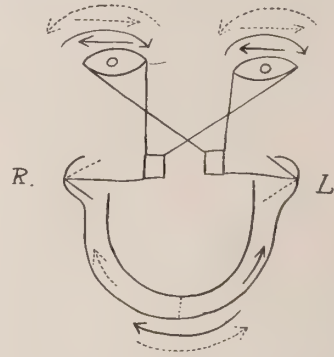


Fig. 3.—Black line=patient turned to left; during turning, nystagmus to left. Dotted line=turning stopped. Endolymphatic flow to right. Nystagmus to right.

and nystagmus to the left results. However, when the turning is continued, the endolymph flows in the direction of the turning. Now let the turning be stopped—the canals remain stationary, the endolymph flows on toward the right, causing a reversal of the above process. The hair cells of the right ampulla point toward the ampullar, active, or more valued, end, while the left hair cells point toward the non-ampullar, inactive, or less valued, end, causing an active stimulation of the right labyrinth; a consequent quick, rotatoric motion to the right occurs, or nystagmus to the right (Fig. 3).\*

*Caloric Reaction.*—The caloric reaction produces its effect upon the individual labyrinth tested thus: If the right ear is syringed

\*This detailed action applies only to the horizontal semicircular canals, and unless specifically mentioned, only the action of these canals will be considered in this treatise. Time and space forbid the consideration of the physiological activity of the superior and inferior canals.

with cold water at a temperature of 20 to 30° C., the endolymph is caused to sink toward the non-ampullar, or negative, end of the canal, forcing the hair cells into the inactive position (Fig. 4). The left labyrinth, remaining in its state of potential activity, is now more active than the right labyrinth, and a slow ocular motion ensues to the right. The fast rotatoric movement is to the left and nystagmus to the left results.

Hot water at 40° C., when syringed into the right ear, produces the opposite effect. A rise of endolymph forcing the hair cells toward the ampullar, or more valued, end, the potential activity is now made more active, and the left labyrinth still remaining in its potential state, a slow motion of the eyes to the left is produced and

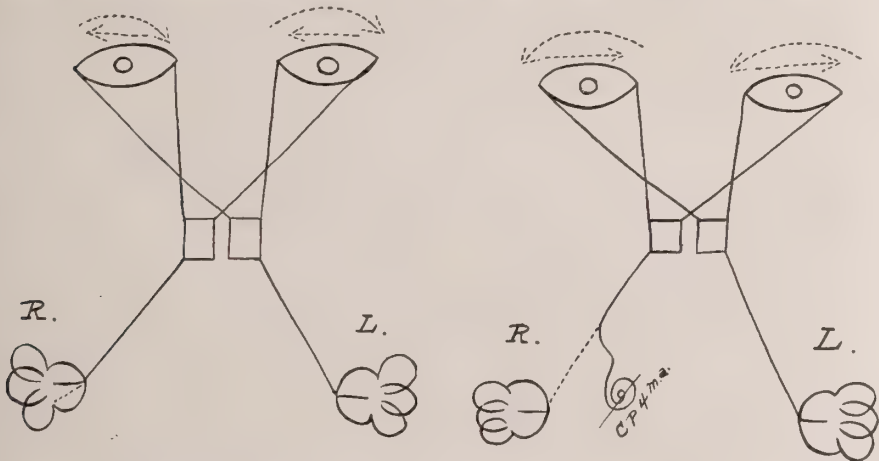


Fig. 4.—Caloric reaction. Cold water 20-30°. Right side tested. Nystagmus to left. Dotted line pointing to right=slow vestibular component. Dotted line pointing to left=fast cortical component.

Galvanic Reaction. Cathodol pole 4 m. a. Right side tested. Nystagmus to right. Dotted line pointing to left=slow vestibular component. Dotted line pointing to right=fast cortical component.

a quick motion to the right, or nystagmus to the right. In testing the left ear, there occurs, naturally, a reversal of the processes.\*

*Galvanic Reaction.*—The galvanic reaction, like the caloric, tests the individual side, but, unlike the caloric, produces its effect only on the vestibular nerve, and not upon the endolymph, giving what is termed a retro- or post-labyrinth test. The cathode pole, when placed over the tragus of the ear to be tested, with the anode at some indifferent point, causes with 4 m.a., when the current is closed, a catelectrotonus of the nerve on the side tested. This then

\*If the right ear is syringed with cold water and head is bent forward and downward 180°, there occurs a rotatoric nystagmus to the right. Bárány's explanation of this is, that in this position the summit of the anterior vertical canal becomes the lowest point in the labyrinth, and in this position cold water results in a flow of the endolymph from the ampulla to the summit and rotatoric nystagmus to the side tested.



becomes in an active state of stimulation; the eyes are drawn slowly to the opposite side and there occurs nystagmus to the side tested. When the current is broken, the negative phase of the stimulation occurs and a reverse action takes place. If the anode pole is applied in the same manner, at the closing of the current, anelectrotonus is produced. This negative, or less valued, irritation allows the eyes to be drawn by the activity of the opposite nerve apparatus slowly to the same side, thus producing nystagmus to the opposite side. When the current is again opened, a reversal of the process also occurs.

*Clinical Nystagmus.*—Having considered the causes and effects of physiological nystagmus, the clinical phases of this reflex will now be studied with special reference to their interpretation. As to the kinds of nystagmus, three forms are recognized, and by their direction are designated, horizontal, vertical, and oblique. Its intensity is known as, 1st degree, when nystagmus is seen with view to the side to be tested; 2nd degree, with view straight ahead; and 3d degree, with view to opposite side. Pathologically, three forms of spontaneous nystagmus are considered: (a) Nystagmus to both sides (extreme view to right and left); (b) to the diseased side; and (c) to the well side.

Vestibular nystagmus must be differentiated from (1) congenital nystagmus, which is oscillating, or undulating, in its motion and is not increased by movements of the eyes in any direction. The movements are large and may be seen meters off. This nystagmus occurs without dizziness.

(2) Optic nystagmus, produced by diseases of the eye muscles, anomalies of the optic bulb and errors of refraction. It disappears by closing the eyes and by lack of fixation.

(3) Neurotic, or hysterical, nystagmus occurs only in the extreme right or left seeing directions and increases rapidly in repeated right and left view. After mental strain, anxiety, etc., it is increased.

A true irritation of the semicircular apparatus results in nystagmus, dizziness, disturbances of equilibrium, muscle cramps and vomiting, and it is this symptom-complex which is embraced in the term 'vestibular nystagmus.'

*Examination of Patients.*—After it has been ascertained that there is a spontaneous nystagmus present, and its kind in reference to direction and degree is determined, the patient is then subjected to the following tests:—

*Fistula Test.*—Compression and aspiration are made in the external auditory canal, just as in eliciting the Gellé test. If a fistula be present in the osseous labyrinth, compression and aspiration will cause an endolymphatic flow and a resulting movement of the hair cells, followed by nystagmus. (This test is especially of

value in circumscribed labyrinthitis with fistula, and elicits the so-called 'fistula symptoms.')

*Turning Test.*—The patient is placed in a revolving chair, with the head bent slightly forward and eyes closed. Opaque glasses are placed before the eyes, to prevent fixation of vision when the eyes are again opened. If the left ear is to be tested, the patient is turned, to the right ten times, with increasing rapidity. After the tenth turn, the patient is stopped, the eyelids are raised, and with view straight ahead, the duration of the nystagmus is noted. Normally, there should be present nystagmus to the left, lasting from fifteen to forty seconds. If by some diseased process in the labyrinth (serous, or suppurative, labyrinthitis), the function is impaired, the nystagmus is of shorter duration than that elicited when testing the right, or well, ear. There exists individual differences in the sides tested normally, but when the difference in the nystagmus of both sides is one-third as to one, relative to the duration of time, a true pathological difference is manifest. Even though there occurs a spontaneous nystagmus as a result of an active disease process in the labyrinth, yet when tested the labyrinth is found less capable of producing a reflex by physiological stimulation than the normal labyrinth.

*Caloric Test.*—In eliciting this test, there are a number of factors influencing the results obtained: The external canal, membrana tympani and middle ear should be carefully examined for impacted cerumen, thickened drum, perforations, inflammations, pus, etc., as abnormal conditions tend either to retard or hasten the reaction. As before mentioned, the caloric test is an individual reaction, irritating only the side tested. With the patient's head in the erect posture, a quantity of cold water, 20 to 30° C., is syringed into the external auditory canal of the ear to be tested. At the first sign of artificially produced dizziness and nystagmus to the opposite side, the quantity of water used is measured. The opposite ear is in a like manner tested (with warm water 40°, a reversed result is produced). The interpretation of the result is obtained by a comparison of the amount of water used in the two ears. All things being equal, the amount of water used should be relatively the same. Let one labyrinth be diseased, and the reaction is slower to become manifest. In other words, the more intensive the disease, the greater is the quantity of water used, until a complete destruction of the labyrinth occurs, when no amount of water can produce nystagmus.

*Galvanic Test.*—Where no spontaneous nystagmus exists, the cathode pole of the galvanic current with a strength of 4 m.a. will produce nystagmus to the same side as described under galvanic reaction, but when a spontaneous nystagmus is present, the current strength must be increased proportionately to the existing

nystagmus; therefore this test has its limitations, because the patient can endure at the most only 20 to 30 m.a. With Bárány's fixation apparatus, the eyes are fixed at a point where the spontaneous nystagmus is first lost. Stimulation of the vestibular nerve with a cathodal current sufficient to elicit the reflex, nystagmus to the side stimulated is produced, while the opposite result is obtained with the anode. This action is independent of the endolymph in the semicircular canals and serves to differentiate disease processes in the labyrinth from those lying posterior to it, or retro-labyrinth diseases; as, for example, a patient has spontaneous nystagmus to both sides. Turning and caloric tests shortened on right side ( $\frac{1}{3}$  as to I), galvanic test normal (nystagmus elicited with 4 to 8 m.a.). The disease is labyrinthine in origin and the retro-labyrinth structures are not affected. Let, now, the galvanic test show a lessened irritability (nystagmus elicited with 20 to 30 m.a.) on the right side in the above case, and the trouble has its seat as well retro-labyrinthally.

*Diagnosis.*—Tests individually are not sufficient evidence to make a diagnosis, and only after carefully considering all phases of nystagmus, such as spontaneous nystagmus, dizziness, disturbances of equilibrium, other reflex disturbances, hearing, etc., can a definite conclusion be reached. To do this, it is necessary to have a definite standardized mode of procedure, classifying into certain distinct groups each individual symptom-complex. Alexander has accomplished this in labyrinth diseases by dividing all nystagmus cases, according to their findings, into five general classes, as follow:—

	N	I	II	III	IV	V
Spontaneous Nystagmus .....	∅	↔	To dis-eased side	To well side	↔	∅
Dizziness. ....	∅	∅	+	$\frac{+}{\emptyset}$	∅	∅
Disturbances of Equilibrium..... Reflex Disturbances.....	∅	∅	+	+	+	+
Turning, Caloric and Galvanic..... Nystagmus. . . . .	∅	∅	$\frac{+}{\emptyset}$	$\frac{+}{\emptyset}$	∅	∅
Hearing. ....	+	+	+	$\frac{+}{\emptyset}$	∅	∅

+ = Reaction, ∅ = No reaction,\* ↔ = Reaction to both sides.  
\*In Class N and I ∅ Normal turning, caloric and galvanic nystagmus. N represents the normal, where all findings are negative.



Group I includes those cases having spontaneous nystagmus with no other reflex disturbances and significant of cerebral, ocular, or hysterical nystagmus, or some barely perceptible vestibular irritation, as in fistula of the semicircular canal, when the diagnosis is made by means of the fistula test.

Group II represents a definite disease of the vestibular apparatus on the tested side without complete destruction, as in a circumscribed labyrinthitis with spontaneous nystagmus to the diseased side. Dizziness, disturbances of equilibrium and reflex disturbances are present. The turning test shows a diminished excitability, as does the caloric test. The galvanic test should be normal. In a serous labyrinthitis, during the early stages, the caloric test may be lost, while the turning test is still present. Hearing is present, but may be impaired.

Group III is produced by a complete destruction of the vestibular apparatus, as in a diffuse suppurative labyrinthitis, causing nystagmus to the well side. Dizziness is present, but may be eventually lost, due to the compensating influence of the sound labyrinth. Disturbances of equilibrium are found and one, or more, of the reflex disturbances may, or may not, be elicited, depending upon the duration of the disease. When the cochlear apparatus is completely involved, there is total loss of hearing, otherwise there may still be a remnant of hearing remaining.

Group IV represents those cases of complete destruction of the vestibular apparatus where compensation is taking place. Spontaneous nystagmus is present, no dizziness remains, but disturbances of equilibrium are found. Reflex disturbances are wanting and hearing is entirely gone.

Group V comprises simply old cases of complete destructive labyrinthitis, where compensation is and has been for a long period of time established. When spontaneous nystagmus is present, it is rotatoric to the well and horizontal to the diseased side. The only permanently manifest symptoms are disturbances of equilibrium and total loss of hearing.

*Cerebellar, or Post-Labyrinth Nystagmus.*—There are certain signs, when considered from a diagnostic point of view, which serve to differentiate cerebellar nystagmus from nystagmus having a vestibular origin. Vestibular nystagmus occurs suddenly and its force and intensity is most marked at the onset. Owing to the sedative influence of the cerebellum and the propensity to rapid compensation, it soon disappears and only in complete destruction are there found even disturbances of equilibrium remaining. Cerebellar disturbances, on the other hand, have their onset gradually and are ever increasing and are relieved only by removal of the exciting cause. Neumann has found in nystagmus cases of cerebellar origin, where the caloric test was elicited (cold water), that

a nystagmus out of all proportion to the amount of water used was produced, this nystagmus lasting as long as eight to ten minutes. He calls this 'nystagmus clonus,' and attributes it to a loss of the inhibitory power exerted by the cerebellum.

When the patient is turned, a subjective sensation of turning in the same direction is produced, but when the turning is stopped, the patient experiences an after-sensation of turning in the opposite direction. This after-sensation is supposed to have its origin in Deiters' nucleus.

If the patient is allowed to stand, he falls in the direction of the after-turning sensation. If allowed to point at a given object, with eyes closed, he points not at the object, but in the direction of the after-turning sensation. This Bárány calls the 'normal error of pointing.'

Let the patient have a disturbance in the cerebellum, the normal after-turning sensation is interfered with and the patient does not present the normal error in pointing, but may even point in the direction of the turning. This abnormal error in pointing is considered by Bárány as pathognomonic of cerebellar disturbances. Neumann and others claim for it no certainty in diagnosis, and in one case, even when present in a supposed tumor of the cerebellum, the tumor was found at post-mortem in the opposite frontal lobe of the cerebrum.

#### CONCLUSION.

From the above résumé of this interesting reflex, its causes and effects, it is seen that it is the outcome of definite physiological activity. While the interpretation seems complex, and, at times, often impossible, by following a definite mode of procedure and considering all the manifestations as a whole, positive diagnosis of labyrinth diseases is obtained, and with such certainty that nystagmus has been the means of classifying and differentiating those diseases heretofore clinically unknown. As an aid to cerebellar diagnosis, the same complexities are met with as in other forms of brain diagnosis, but when considered with all other findings, its value is beyond question. It is also within the scope of a possibility that with closer study and consideration, it may reach the same importance, as a diagnostic measure, as it has in internal ear diseases.

Humboldt Building.

NOTES ON A CASE OF NASO-LACHRYMAL DISEASE,  
WITH REMARKS.

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By ALFRED KAHN, M. D., of New York.

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H. B. B., *æt.* sixty-six, was referred to me by an oculist whom he had previously consulted about 'watering of his left eye.' I was to make a nasal examination and report to him. The patient complained of severe frontal headache, pain off and on over the left side of his face, the pain being of a neuralgic character.

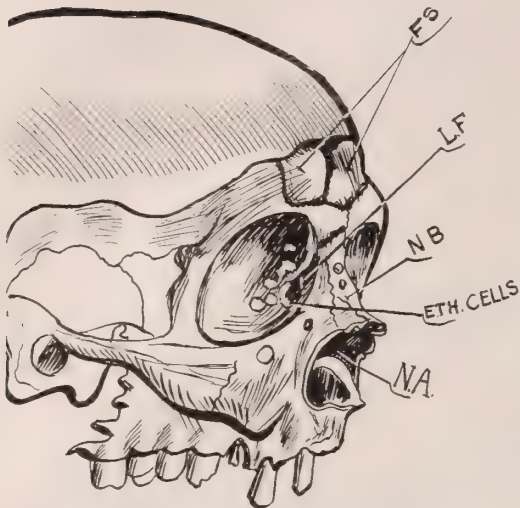
*General History.*—Patient was lame (having a gait of a 'locomotor-atactive' nature, and history of lightning pains). His family physician assumed him syphilitic, and judging from the character and general appearance of the man, I believed this assumption probably correct. His blood had frequently been examined (Wassermann), but has always proved negative. He had been under syphilitic treatment with no result, no improvement. Historically in every other way he was normal; and except for the locomotor affection and the lachrymal lesion, which I am to describe, normal. I especially wish to mention that his teeth, ears and eyes (vision), and nervous system presented no evidence of any disease and he gave no history of rheumatism or allied diseases. His left antrum of Highmore was radically operated three years previously.

*Physical Examination and His Lesion.*—On examination, I found that his tears overflowed from the left eye, the right eye was normal. Considering the left eye further, there was a *very slight* bulging in the region of the lachrymal sac, by comparison with this region on the right side. Pressure over the lachrymal-sac region caused an outflow of mucus into the conjunctival sac from both the upper and lower lachrymal puncta (there was no pus). The frontal, nasal and lachrymal bones, etc., in this region, did not, up to this point in the examination, show any evidence of disease.

*Nasal Examination and Location of Lesion.*—Left Nasal Cavity. The left nasal cavity was very much larger than usual, the inferior turbinate bone was partially destroyed, evidently at the antrum operation. The inferior meatus communicated with the partially obliterated antrum of Highmore. The whole nasal cavity presented a marked chronic rhinitic catarrhal appearance. There was a great deal of dried secretion and thick mucus. The secretions were of a foul odor. The exhaled air from the nose was musty and a source of great annoyance to the patient and others. The secretions and scabs were removed, and pus was found leading to the anterior and posterior ethmoid cells. The sphenoid and frontal sinus were also involved. There was an ulcerous cavity in the anterior ethmoid just at the inner side of the lachrymal plate, which bled freely on the slightest pretense. This ulcerous cavity was the only spot in the whole chronic appearance that acted in this way. Clinically, the local lesion looked like a sarcoma, or syphilis. There was not a distinct tumor; there was an ulcerous, bloody cavity containing a mucoid secretion, but *not pus*.

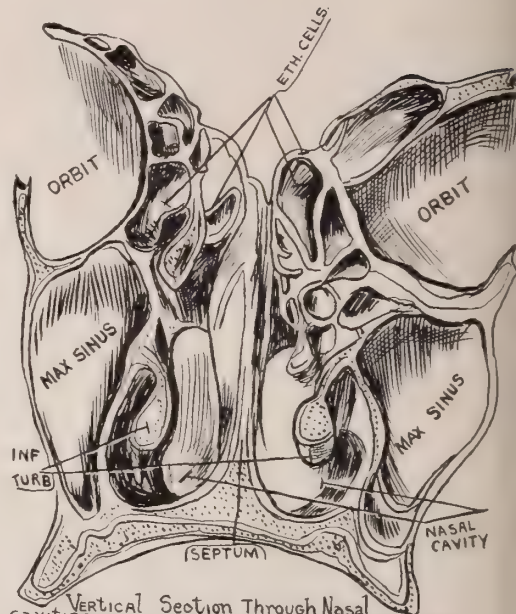
Right Nasal Cavity. This side of the nasal opening was narrowed by a thick defective septum; it presented a chronic catarrhal appearance; otherwise there was not anything particularly to note.





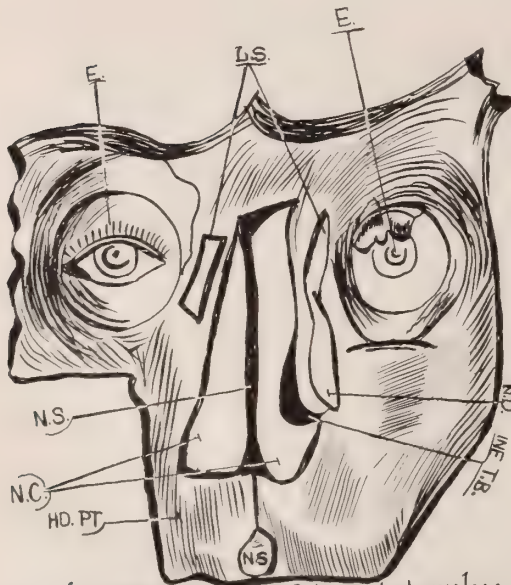
SKULL SHOWING RELATIONSHIP BETWEEN ETHMOID CELLS, LACHRY-MAL SAC, FRONTAL SINUSES & INTERIOR OF NASAL CAVITY  
 F.S. = FRONTAL SINUS.  
 L.F. = LACHRYMAL FOSSA.  
 N.B. = NASAL BONE  
 N.A. = NASAL APERTURE

Fig. 1.



VERTICAL SECTION THROUGH NASAL CAVITIES; SHOWING CLOSE RELATIONSHIP BETWEEN ETHMOID CELLS AND ORBIT.

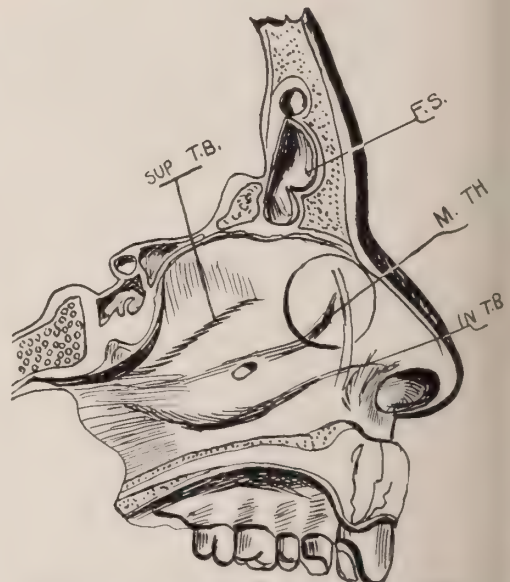
Fig. 2.



CORONAL SECTION: ON THE RIGHT SIDE THE LACHRYMAL SAC; ON THE LEFT SIDE BOTH THE LACHRYMAL SAC & DUCT. SHOWS HOW INTIMATELY THEY ARE ASSOCIATED WITH THE INTERIOR OF THE NOSE INTERNALLY; AND EXTERNALLY TO THE ORBITAL CAVITY.

E= EYE; L.S.= LACHRYMAL SAC; N.D.= NASAL DUCT  
 INF. TB.= INFERIOR TURBINATE; N.S.= NASAL SEPTUM;  
 N.C.= NASAL CAVITY; HD. PT.= HARD PALATE.

Fig. 3.



THE LATERAL NASAL WALL VIEWED FROM WITHIN  
 DOTTED LINE SHOWS AREA TRAVERSED BY LACHRYMAL DUCT. CIRCLE ENCLOSES THE ANTERIOR ETHMOID CELLS. SUP. TB.= SUPERIOR TURBINATE. FS= FRONTAL SINUS; M. TH.= MIDDLE TURBINATE; INF. TB.= INFERIOR TURBINATE.

Fig. 4.

Lachrymal Apparatus on the Left Side. It was easy to pass a small probe into the lachrymal sac. The duct was obstructed and I could not pass it beyond the sac into the nose, the obstruction being at a point opposite the ulcerous lesion which I described above in the left nasal cavity. (I did not at this time know the character of the nasal lesion, though I suspected nasal disease.) The lachrymal sac contained a mucous secretion, but no pus; pressure ejected this mucus readily into the conjunctival sac. The fluid always accumulated from day to day and would fill the sac to its capacity; then the eye would 'water.'

*Treatment.*—This man had been, for some years past, under syphilitic treatment; his general condition had not improved; rather, he was inclined to 'go backward.' He did not feel as well as previously. I mention this as a factor to be considered together with facts already stated, to prove the great possible absence of syphilis. Outside of a very slight clinical appearance, it was not sarcoma.

Local Treatment Externally. The lachrymal sac was pressed, and washed out with a mild boric solution; the punctum was not slit up. A small-sized probe was passed through the sac into the duct, to the point of obstruction, the sac and punctum having previously been cocaineized.

Local Treatment Inside the Nose. The anterior middle and posterior ethmoid cells were curetted; the lachrymal duct was cut off and curetted below the point of obstruction, and the probe was pushed through into the nose. A part of the lachrymal and adjacent bone, surrounding the upper part of the duct, was nipped away. The lachrymal duct was probed daily until now it remains open. The frontal sinus as well as the sphenoid sinus was opened endo-nasally; these cavities are washed frequently with mild solutions through the nose.

*Result.*—Lachrymation cured; headaches entirely relieved; no odor from nasal air; general condition improved; no external scar or other alteration of cosmetic appearance from operation (a distinct advance over a lachrymal sac operation or frontal sinus operation). The left frontal sinus still discharges slightly, and though it is washed out frequently (protargol and gumminol) I trust a radical frontal operation may be avoided.

#### REMARKS.

In looking over the literature of this subject, I have been impressed by what Onodi, in his recent publication, has to say about the disease of which we are treating. He says, in effect, the following: "Within recent years, attempts to affect radical cure of diseases of the lachrymal efferent organs by nasal operations have become much more numerous. We shall cast a glance over the various suggestions and procedures, beginning with a few historical points. In recent treatises on the subject hardly any reference is made to the interesting fact that it is long since the proposals we look upon as modern were first suggested and carried into effect. In like manner it is long since the etiological connection between diseases of the nasal duct and diseases of the nose was first recognized. As long ago as the first half of the eighteenth century the formation of an artificial passage for the tears was recommended by Woolhouse and carried by him into effect. In severe cases Woolhouse extirpated the lachrymal sac and established a new and per-

manent channel into the nose. After Woolhouse, the operation was performed as follows by Plattner. The lachrymal sac was extirpated and a probe introduced into the canaliculus. The lachrymal bone was then perforated with a sharp hollow sound which was rotated in order to make the opening circular. A conical metal cannula, with a shoulder of gold, silver or lead, was next introduced and the wound was closed over it. The cannula was left *in situ* for several months. Now and then it dropped of its own accord into the throat. When the lachrymal bone was carious the perforation was made with a cautery.

Great interest attached to Goethe's description of the operation as he saw it performed by Lobstein on Herder in Strassburg: "The lachrymal sac, as it is called, is too narrow in its lower part, hence the secretion it contains cannot flow away into the nose, all the more so as the opening in the adjoining bone, through which the secretion naturally passes, is also deficient. For this reason, the floor of the sac has to be incised and the bone perforated. A horse-hair is then passed through the lachrymal puncture, the opened sac, and the new passage communicating with them, and moved to and fro every day in order to keep the communication between the two places from closing." Goethe further remarks: "After so much pain and suffering the artificial passage for the tears, the communication we wished for, would not form, and it was found necessary to let the wound close." In the first half of the nineteenth century progress came to a standstill, as Hirschberg expresses it. In the first third of the nineteenth century, ophthalmology got rid of the idea of making an artificial opening into the nasal cavity, which is indeed a snare and a delusion.

As we have already remarked, it is long since the etiological connection between affections of the lachrymal passages and those of the nose was first recognized. In Kuhnt's experience, diseases of the lachrymal passages have a nasal origin (93.7 per cent. of cases). It is obvious that the nasal communication may provide a route whereby infection can travel and set up disease in the nasal duct and tear-sac secondary to that in the nose. According to Aubaret, when the fold of mucous membrane which acts as a valve at the ostium is insufficient, it is quite possible for fluid, and still more so for air, to pass up from the nose into the nasal duct, and through the duct into the lachrymal sac. During violent blowing of the nose, also, particles of secretion can be forced upward into the lachrymal sac. The ascent of minute particles of tobacco-snuff as far as the puncta has been observed, and Salus witnessed air and cigar smoke blown in a continuous stream through the punctate apertures. In nose-bleeding, Schenk observed blood issue from the puncta. Fein, in a case in which the nasal duct had been injured in perforating the antrum, saw air emerging from the punc-



tum. Obviously, infection may be conveyed in these air-currents, and when infective particles of mucous membrane and divers micro-organisms are propelled into the lachrymal passages, they will tend to induce a metastasis or an extension of the disease-process. It may, however, be remarked that micro-organisms in the conjunctiva, as well as in the nose, can set up an inflammation of the lachrymal sac. Etiologically, an important part is played by all changes in the nose which mechanically obstruct the passage of tears, whether at the nasal orifice or higher up in the duct. Inflammatory processes affecting the mucous membrane of the nose may extend to the efferent lachrymal passages, and the pressure, however induced, will dam back the lachrymal fluid.

Short of actual obstruction in the lachrymal passages, there may be reflex neuroses set up which can evoke from the nose a reflex epiphora. The ostium of the nasal duct may be wholly or partially occluded by hypertrophy of the turbinals, by polypoid or papillary degeneration of the anterior end of the inferior turbinal, by foreign bodies, dental cysts, syphilitic or tuberculous lesions, by rhinoscleroma, by synechiæ between the turbinal and the floor of the nose, by periostitis in the neighborhood of the ostium, and also by the formation of scar-tissue in this region. Further, changes which take up space or exercise pressure, such as tumors, polypi, the so-called bone cysts, cystic swelling of the middle turbinal, mucous or purulent, and spurs and deviations of the septum, will have a like effect. Closure of the nasal duct may also be brought about by destruction of bone, and by traumatism, such as obstructive fractures of bony walls. Kuhnt once saw the lumen of the duct completely obliterated for a length of 7 or 8 mm. by periosteal bone-formation. In atrophic rhinitis extension of the atrophic process to the duct with atrophy of the bony wall has been observed (Krieg).

The ethmoid cells, when enlarged or when abnormally located, particularly through disease, encroach upon space and exercise pressure, and so take part in the etiology of diseases of the lachrymal structures. An important rôle is played by empyema of the adjoining accessory sinuses. Invasion of the efferent lachrymal organs by chronic separation of the frontal sinus, ethmoidal cells and maxillary antrum has been observed, ethmoidal suppuration being the most frequent offender.

In the transference of disease through the bone, from the mucous lining of the accessory sinuses to the lachrymal organs, both the venous network and the lymphatics play a part. The venous spaces in the nasal mucosa communicate freely with the mucous lining, both of the accessory sinuses and of the nasal duct. The venous space of the nasal duct and the lachrymal sac anastomose with the facial, ophthalmic and infraorbital veins. The lachrymofacial

vein, described by Zuckerkandl, communicates with a larger venous trunk which emerges from the anterior ethmoidal cells and passes through the lachrymal bone. Perforation of the bony 'party-wall' and of the lachrymal sac may occur. A collection of pus may appear between the bone and the wall of the lachrymal sac, and also between bone and skin, with the formation of a fistula.

Quite recently Rehse has emphasized the importance of ethmoidal cell suppuration in the production of disease of the lachrymal sac.

Peters and Hammer maintain that both phlegmonous inflammation of the lachrymal sac and the fistulous processes are preceded by disease of the maxillary antrum.

Cysts, tumors and polypi of the antrum, together with dental cysts, may, by the pressure they exert, lead to secondary stenosis of the nasal duct. In suppuration affecting this cavity, and in syphilitic and tuberculous conditions, destruction of bone with the formation of sequestra may also occur.

Epiphora, suppuration of the lachrymal sac, lachrymal fistula perforation of the medial wall of the antrum in the inferior and middle meatus, the formation of sequestra and perforation of the nasal duct, have been described among the complications of maxillary antrum suppuration. In frontal sinus suppuration—epiphora, circumscribed abscess in lower wall of the frontal sinus, suppuration of the lachrymal sac—perforation of the lachrymal sac and perforation of the inferior wall of the frontal sinus have been observed. In suppuration of the ethmoidal cells—suppuration of the lachrymal sac—perforation of the lachrymal sac, fistula formation, and perforation of the ethmoidal cells have been described.

As we have seen, diseases of the nose, as well as diseases of the accessory sinuses, play an important part in the production of affections of the lachrymal sac. Even Bruckner, although he regards direct propagation of nasal diseases into the lachrymal passages as uncommon, admits that in the majority of cases disease of the lachrymal sac is nasal in origin. He also admits the possibility of nasal disease aggravating chronic disease of the lachrymal sac. Finally, it may happen that ethmoidal cell and antrum suppuration may be secondary to suppuration in the lachrymal sac.

Cases are not unknown in which conservative endonasal treatment provides good results. At Kuhnt says, "If the state of the nose be such as to favor the hope of curing it, then, in addition to conservative ophthalmic measures, nasal treatment should be initiated." Musehold noticed in two patients with epiphora a striking effect follow the application of suprarenalin to the neighborhood of the ostium. Conservative nasal treatment is also likely to be successful in cases of simple swelling of the nasal mucosa obstructing the lachrymal ostium, a condition which, although it

does occur in adult life, is nevertheless most frequently found in childhood and especially in early infancy.

Endonasal operation should be undertaken in the case of hypertrophies which occupy space, in polypoid and papillary enlargements of the anterior end of the turbinal, and in the case of foreign bodies and other nasal abnormalities we have already mentioned. Simple resection of the anterior end of the inferior turbinal has many excellent results to its credit. In a case of Fischer's, in which obstruction in the region of the ostium had induced an enlargement of the lachrymal sac almost to the size of a hen's egg, resection of the anterior end of the inferior turbinal brought about complete cure. Excellent results have also followed the removal of foreign bodies mechanically obstructing the ostium. In a word, all obvious abnormalities in the nasal cavity should be radically dealt with in order to restore the normal flow of tears so that disease in the lachrymal sac can be cured. In certain cases, however, these nasal operations do not succeed, and then new ways and means have to be tried.

Polyak recommended the retrograde passage of curved metal sounds through the nose, but so far the suggestion has not been carried out. Generally speaking it could only be performed after preliminary resection of the turbinal, and, according to Kuhn, there is in this region nothing to indicate when the procedure is likely to be of service. In case of stenosis of the nasal duct, Caldwell (1893) introduced a sound to the seat of the stenosis, removed part of the turbinal with an electric trephine, opened up the duct as far as the point of the sound, and so reestablished drainage.

I do not care within the bounds of this paper to discuss the endonasal removal of the lachrymal sac, except to mention that this work has been carried to such a high point that it is comparatively easy to remove this communication between the nose and eye through the endonasal method, and other things being equal, especially where there is present a nasal disease, I am a strong advocate of treatment of the lachrymal conducting-apparatus through the nose. To my mind the lachrymal sac or duct should not be removed until the nasal cavity is entirely explored for nasal disease, as a causative factor of lachrymal disease. The disease (nasolachrymal), where possible, should always to my mind be handled from below. A duct can be made patulous through the nose; this is a strong cosmetic consideration. It is not so often necessary to slit up a lachrymal punctum, particularly when the lachrymal duct usually contains the stenosis. It may often be wise to approach the duct from below. There is a field (where the lachrymal sac is involved and where a radical operation is indicated) for excision of the sac from below, and also a field for the operation from above; both operations should be considered (in any given



case) before the sac is finally removed. I am not advocating the removal of the lachrymal sac from below. I advocate: Locate the lesion, which is usually in the lachrymal duct and easily accessible from the nose, and then choose the preferable operation.

This subject is not only one of surgical interest, but also of considerable gravity. In one case, the outcome may lead to ocular trouble of a serious nature or even loss of sight; in another it may terminate fatally from intracranial complications. What I finally want to point out is that I do not expect the average general practitioner to recognize these detailed nasal relationships; but he should always bear in mind, where a patient complains of symptoms such as we have in this case, that there may be, as a source of cause and effect, either mild or grave nasal disease. I mean, also, that as a last analysis, he may have in close relationship ethmoid and frontal sinus disease with all its dangers.

34 East Fortieth St.

## THE PREPARATORY TREATMENT FOR PROSTATECTOMY.\*

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By CHARLES W. BONNEY, M. D., of Philadelphia.

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It is the opinion of the writer that the pre-operative treatment of prostatectomy as now understood is largely a development of the last decade, for although ten years ago those whose early experience, based upon special opportunities for seeing and treating prostatics, had taught them the disastrous immediate results which followed indiscriminate operations, surgeons in general, whose experience had not been so great, and who perhaps were anxious to do the operation, failed to understand its dangers when done under certain unfavorable conditions, and by their intrepidity sent many an old man to an untimely grave. An examination of the Index Medicus for the year 1904 failed to show the title of any paper dealing with preparatory treatment. A reference to several papers published that year by prominent surgeons showed that a few days of continuous catheterization, together with stimulation, was the only method they resorted to in getting their patients ready for operation, and as near as could be judged, this was done only in the more critical cases. That greater attention has come to be given to preparatory treatment is a matter upon which we can well congratulate ourselves. The important questions are, How shall we be guided and what can we do to reduce the danger of an operation? In answer thereto the following considerations seem appropriate. In the first place, when dealing with a case of prostatic hypertrophy, and especially when considering the advisability of operation, it is necessary to bear in mind that we have to do not only with a mechanically obstructed bladder, but also with other organs, tissues and systems which in the aggregate constitute the bodily economy, and which may have been affected, singly or collectively, in part or in their entirety, by the retrograde changes incident to time, or by the destructive products of disease, and that it is quite as important to give attention to these general conditions as it is to the local one. So when a patient with symptoms of prostatic hypertrophy applies for treatment, his physical condition should be thoroughly investigated and an endeavor made to correct every deviation from the normal. The kidneys, the heart and blood-vessels, the respiratory system, the gastro-intestinal tract, and last, though by no means of lesser importance, the nervous system, will require our most painstaking attention.

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\*Read before the Philadelphia Genito-Urinary Society, April 26th, 1915.

If the renal function is inadequate, as shown by modern tests, such as the phenolsulphonephthalein and phloridzin, together with the estimation of the twenty-four-hour excretion of urea, such medicines as spartein sulphate, theocin-sodium acetate, diuretin, and potassium acetate with infusion of digitalis will be found helpful in improving it. They should be given according to the indications present in each case. For instance, the spartein and digitalis are good when the heart-sounds are weak and the circulation feeble; the potassium acetate when the urine is still acid, and so on. In some cases, too, the old-fashioned Niemeyer pill, judiciously used at intervals, will not only markedly increase the action of the kidneys, but will also clear up the associated symptoms of gastro-intestinal disturbance, causing the dry, glazed and brown-coated tongue to become moist and clean, and making the skin assume a clearer hue and softer texture. Such a change is of decided good omen. If the blood-pressure is high, the nitrites may be given. They not only lower blood-pressure but also promote diuresis. As a rule no direct treatment need be employed for mild nervous symptoms, as they diminish or disappear with the establishment of better elimination. Persistent nervous disturbances, however, betoken post-operative trouble.

If blood examination shows the hemoglobin to be deficient after elimination has been well established, Basham's mixture in full dose is a pleasant and efficient preparation of iron to administer. A favorite prescription has been a drop or two of spirit of glonoin in one-half ounce of Basham's.

As to urinary antiseptics, only one, urotropin, and that in large doses, need be considered. In the hope of possibly reducing vesical infection, the writer at one time used autogenous vaccines, prepared from the micro-organisms found in the urine, but as their action seemed to be nil, they have not been resorted to of late.

Hygienic measures are very important, but the degree to which they can be carried out depends upon the intelligence and means of the patient.

The treatment thus outlined applies to patients having chronic retention and to those who have been relieved of attacks of acute retention. Combined with appropriate local treatment they do much for these classes of patients, reducing residual urine, relieving toxemia, diminishing vesical infection and bringing about such general improvement that after a few weeks the patients can be brought to operation with much greater safety than they could were surgery resorted to earlier.

As to local treatment, attacks of acute retention are to be relieved by catheterization, continuous or uninterrupted, usually the former at first, and the bladder flushed with normal saline solution, weak permanganate of potassium or oxycyanide of mercury solution, or



silver nitrate if there be a bad cystitis. The writer has never found it necessary to do a suprapubic puncture to relieve a distended bladder, and believes that with the proper instruments and sufficient patience and skill, practically all cases are amenable to catheterization. Matters will be facilitated by a urethral injection of adrenalin chloride, and even a little eucaine, to be followed by an injection of warm, sterile oil just before the catheter is introduced. Suprapubic cystotomy for drainage is a procedure quite different from suprapubic puncture for the relief of distension, and is one which has much to commend it as a preliminary to enucleation of the prostate. It relieves vesical symptoms, improves renal function, and enables patients to gain strength.

The condition of a number of patients treated in conformity with the principles herein outlined became so much ameliorated that they decided not to be operated upon, and as some of them have had very little or no disturbance, it may be that they were quite right in their decision. They are under observation and can be operated upon at any time should circumstances alter their decision.

Perhaps the selection of an anesthetic may be considered as part of the pre-operative preparation. If so, then the writer will venture the opinion that there are very few patients who cannot take ether by the drop method if it be given by an experienced and skilful anesthetist. Those with bad bronchitis and emphysema may constitute an exception. Gas and oxygen seems to have much to commend it, if the reports of those whose experience with it has been large are to be accepted. The statement that prostatectomy is never an emergency operation is believed to be an appropriate one with which to close this paper.

THE U. S. ARMY MEDICAL SCHOOL.

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By COLONEL CHARLES RICHARD, Medical Corps, U. S. Army.

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The expediency of a school for the training and instruction of recently appointed officers of the Medical Corps of the Army had long been recognized; in fact, as long ago as 1863, efforts had been made and tentative plans for the establishment and conduct of such a school had been adopted, but for some reason "the project did not receive final approbation and failed to become a reality." It was not until 1893 that the project was again advanced by General George M. Sternberg, at that time Surgeon General of the Army, and the U. S. Army Medical School became an established institution of the Medical Department of the Army. Its establishment was promulgated in General Orders from Headquarters of the Army, dated June 24th, 1893, "for the purpose of instructing approved candidates for admission to the Medical Corps of the Army in their duties as medical officers," and its location was fixed at Washington, D. C.

Prior to the establishment of the School, it had been the practice to assign the newly appointed officer of the Medical Department to one of the larger military stations, where, under an older officer, he acquired but little training in his military duties. The exigencies of the service rarely permitted a prolonged stay at such a station, and the young officer was soon sent elsewhere with but a vague knowledge of his duties as a military officer. He had at this time but slight familiarity with army regulations and the customs of the service, had had no experience in military administration, no comprehension of military discipline, and but little appreciation of the rights, privileges, and responsibilities of his office.

The approved candidate for the Medical Corps is usually well grounded in general medicine and surgery (a minimum of one year's hospital practice is a requirement for admission), but is generally deficient in special subjects, such as bacteriological methods, ophthalmology, x-ray work, and psychiatry. As the military surgeon is usually placed in circumstances where other professional aid and counsel are not available, and since in his military practice he has to treat the many diseases that may occur in his community, the course of instruction at the Army Medical School is designed not only to instruct the candidate for admission to the Medical Corps in his military duties, but also in special branches of his profession.

The first session of the Army Medical School opened November 1st, 1893, with a class of five recently commissioned officers. The faculty consisted of four professors selected from among the senior medical officers, stationed in or near the city of Washington, whose duties in connection with the School were additional to those of their other assignments. The order assigning them to this duty directed them "to give practical instruction in methods of sanitary analyses, microscöpic technique, clinical microscopy, bacteriology, urine analysis, etc."

The course of instruction was of four months' duration and embraced the following subjects:—

1. Duties of medical officers in war and peace (including property responsibility, examination of recruits, certificates of disability, reports, rights and privileges, customs of service, etc.).
2. Military surgery (including the care and transportation of wounded).
3. Military hygiene (including practical instruction in the examination of air, water, food, and clothing from a sanitary point of view).
4. Clinical and sanitary microscopy (including bacteriology and urinology).

After several years' experience, it became manifest that an expansion of the course was desirable; in fact, the advances in medicine, especially in laboratory methods, and the occupation of tropical countries by our army, made a more comprehensive course almost imperative, if the high standing of the Corps was to be maintained. The number of the subjects to be pursued was therefore increased, and the period of instruction was extended to eight months, at which it rests at present.

With the exception of the period during and following the Spanish-American war (1898-1901), the School has held yearly sessions. The smallest number under instruction in any one year has been five; the largest, sixty-two. At the beginning of the current term, the number of student officers numbered nineteen, four of whom are officers of the Organized Militia.

In the earlier years of its existence, the students as already noted, were the recently commissioned officers of the Medical Corps. The plan of first commissioning the successful candidate and then assigning him to the School for instruction, proved unsatisfactory. Some of the students, assured in their positions, lacked incentive to do their best work, and failed to make the best of the opportunities.

In 1905, this plan was changed; instead of commissioning the approved candidates they were given appointments as contract surgeons and then ordered to the School for instruction; their contracts could be annulled by the Surgeon General at any time. They



were not commissioned in the Medical Corps until they had passed a satisfactory examination at the end of the school term.

After the passage of the Act of Congress of April 23rd, 1908, reorganizing the Medical Department of the Army and establishing a Medical Reserve Corps, instead of being given contracts, the approved candidates were commissioned 1st Lieutenants in the Medical Reserve Corps and assigned to active duty for instruction at the School. The commission gives the candidate a more dignified status than that of contract surgeon, but it can be abrogated by the President at any time. This is the plan now in operation. This proved more satisfactory than the former plan of commissioning the candidates before passing them through the School; the students applied themselves more earnestly, and attained higher averages.

Under this system, the candidate is virtually on probation during the school period, and the faculty is able to form a fairly good opinion of his general character, habits, professional qualifications, and aptitude for the service. If he is found unsatisfactory or disqualified for any reason, his connection with the service can be terminated at any time. Not until he has passed a satisfactory mental and physical examination at the end of the school period, and his general character and aptitude for the service are considered satisfactory, is he recommended for a commission in the Medical Corps of the Army.

For seventeen years after its establishment, the School was located in the Army Medical Museum and Library Building, at 7th and "B" Streets, S. W. The extension of the curriculum and the increased size of the classes, following the increase in the Army and the Medical Corps, made more space necessary than was available in the Museum and Library Building, and the School was removed to a leased building at No. 721 Thirteenth Street, N. W., where it still remains.

The building (Fig. 1) was originally an office building of six stories. The five upper stories are occupied by the School, the interior having been remodeled to adapt it to school work. While it is not as well arranged as one specially constructed for this purpose and has other objectionable features, it fulfils the requirements. It contains a lecture-room of ample size, a library, and the necessary offices, laboratories, store-rooms, animal-rooms, etc.

The laboratories (Figs. 2 and 3) are conveniently arranged, and are equipped with the best type of apparatus, appliances, and instruments, in fact nothing is lacking in the equipment that could conduce to more effective teaching.

All candidates for appointment in the Medical Corps who pass the preliminary examination are required to attend the School. The school term of candidates for the Medical Corps commences



Fig. 1.—U. S. Army Medical School, Washington, D. C.



Fig. 2.—View of the X-ray Laboratory.

October 1st of each year, and continues for eight months. The students are provided with the necessary textbooks and materials free of cost.

Appointment to the Medical Corps of the Army is made by the President after the applicant has passed the prescribed examination and has been recommended by the Surgeon General.

An applicant for appointment in the Medical Corps of the Army must be between twenty-two and thirty years of age at the time of



Fig. 3.—Students' Bacteriological Laboratory.



Fig. 4.—Photomicrographic Apparatus.



taking his preliminary examination, a citizen of the United States, and a graduate of a reputable medical school legally authorized to confer the degree of doctor of medicine, in evidence of which he is required to submit his diploma to the board at the time of his preliminary examination.

Hospital training and practical experience in the practice of medicine, surgery, and obstetrics are essential, and the applicant is required to present evidence that he has had at least one year's hospital experience as an intern after graduation.

The examination consists of two parts—a preliminary examination and a final or qualifying examination, as hereinafter described, with a course of instruction at the Army Medical School intervening.

The preliminary examination is as follows:—

(a) *Physical*.—The physical examination is thorough. Candidates must not be less than 64 inches in height. Each candidate is required to certify that he labors under no physical infirmity or disability which can interfere with the efficient discharge of any duty which may be required. Errors of refraction, if vision is not below 20/100 in either eye, are not causes for rejection, provided they are not accompanied by ocular disease and are entirely corrected by appropriate glasses.

(b) *Written*.—The written examination embraces the following subjects: Anatomy, physiology and histology, chemistry and physics, materia medica and therapeutics, surgery, practice of medicine, obstetrics, and gynecology.

The preliminary examinations are conducted under instructions from the Surgeon General by local boards of one or more medical officers, and by a central board of not less than three, which is known as the Army Medical Board.

Applicants who attain a general average of not less than 80 per cent. in the preliminary examination and are deemed otherwise acceptable, as already noted, are appointed to the Medical Reserve Corps with the rank of 1st Lieutenant, and ordered to the Army Medical School for instruction as candidates for admission to the Medical Corps of the Army. An applicant thus selected is, before entering the school, required to make an agreement to accept a commission in the Medical Corps if found qualified in the final examination and serve at least five years thereafter, unless sooner discharged. Candidates undergoing instruction at the Army Medical School receive the pay and allowances of 1st Lieutenants, including travel pay from their homes to Washington.

The course of instruction is both practical and theoretical, and comprises the following subjects:—

1. Military surgery.
2. Medical department administration.

3. Military medicine and tropical medicine.
4. Ophthalmology.
5. Military hygiene.
6. Bacteriology, pathology, and laboratory diagnosis.
7. Sanitary chemistry.
8. Sanitary tactics.
9. Roentgenology.
10. Operative surgery on the cadaver.
11. Equitation.

Its character and scope may be seen from the following synopsis:—

*Military Surgery.*—This course consists of didactic lectures on the traumatisms of war; it embraces descriptions of weapons and projectiles used in warfare; the mechanics of projectiles; their effects upon the tissues of the body at different ranges; complications; action of explosives; treatment of gunshot wounds and of their complications, on the field, and subsequently; wound infections; statistics of battles and campaigns. These lectures are illustrated by lantern slides, skiagraphs, pathological specimens, and experimental gunshots on the cadaver.

*Medical Department Administration.*—In this course are included general duties of the Army medical officer; Army Regulations and Medical Department Regulations, and their applications; customs of the service; military organization, rank, command, etc.; recruiting; methods of payment; administration of the Hospital Corps and the Army Nurse Corps; duties of medical officers on boards of examination, promotion, and retirement; military correspondence; methods of keeping records; hospital administration; methods of obtaining, caring for, using, accounting for, and disposing of public property; and the various methods of making purchases and of securing service. Student officers are required to make out and submit the various reports and returns, vouchers, and other formal documents which are used in the military service.

*Military Medicine and Tropical Medicine.*—In this course are discussed the meteorology of the tropics; influences of climate in the causation of disease; lectures upon tropical diseases, including the protozoa causing disease in man; malarial infections and their prophylaxis and treatment; yellow fever, Malta fever, relapsing fever, typhus fever; cholera; beri-beri; trypanosomiasis in man; the dysenteries; filariasis; guinea worm; and other parasites.

*Military Hygiene.*—This course embraces general and personal hygiene; food, clothing, water, disposal of wastes; marches and marching; barracks, buildings, and camps; ventilation; plumbing; disinfection and disinfectants; inspection of meat and milk; morbidity and mortality statistics; sanitation of the battle field. These lectures are illustrated by sanitary appliances, models, etc.

*Bacteriology, Pathology, and Laboratory Diagnosis.*—More time is allotted to this course of the curriculum than to any other. It is a practical laboratory course in which the student is required to prepare culture media and stains; mount his preparations; isolate and differentiate bacteria; inject animals, etc. It includes the study of bacterial diseases and their pathology, and the identification of the bacteria causing them; bacteriological examinations of water and milk; spirochætæ; fungi; lectures and practical work on agglutinins, the Wassermann reaction, ferments, and anaphylaxis; preparation of bacterial vaccines; clinical blood work. In protozoology, the amebæ, malarial plasmodium, trichomonas, trypanosomes, etc., are studied.

A course in helminthology, by lectures and the preparation and study of specimens, and a course in entomology, consisting of the study, identification, and differentiation of disease-bearing insects, are included in this department.

The rich material of the Army Medical Museum is available for this course, and is freely drawn upon.

*Ophthalmology.*—The theoretical instruction in this course covers general optical principles, exposition of the errors of refraction and anomalies of accommodation, and the theory of the ophthalmoscope and retinoscope. In the practical work of this course the normal fundus of the schematic eye is studied, followed by a study of the normal fundus of patients; later, the various diseases of the eye and errors of refraction are studied clinically. The final examination is entirely practical, and includes correction of the errors of refraction, diagnosis of fundus conditions, and the systematic examination of cases.

*Sanitary Chemistry.*—This course consists entirely of work in the chemical laboratory; qualitative analyses of different groups of metal; examination of stomach contents, quantitative and qualitative; examinations for the commoner poisons and alkaloids; chemical analysis of urine; chemical analysis of water; examination of air; determination of purity of pharmacopeial substances; examination of foods, etc.

*Sanitary Tactics.*—This course embraces the various drills; methods of removing wounded; tent pitching; instruction in the use of equipment; organization and the work of the field units of the Medical Department, including map reading and sanitary service problems. Instruction in this course is largely practical.

*Roentgenology.*—In this department, the nature, properties, and laws governing electricity, and character and properties of the  $x$ -ray are discussed; the mechanism of the various apparatus for generating  $x$ -rays, transformers, radiography and its technique are covered. Students are required to make radiographs of different portions of the body, to develop the plates and interpret their findings.



This work is almost entirely practical, and the students are instructed in all the details of this subject.

*Operative Surgery on the Cadaver.*—This course embraces ligations, amputations, resections, head, chest, and abdominal surgery, etc., with a review of the surgical anatomy of the parts operated upon.

*Equitation.*—The course in equitation is given by an officer of the mounted service, at Fort Myer, Virginia; one and one-half hours weekly during the entire term are devoted to this instruction; few of the candidates have had any experience in riding; this instruction makes them competent horsemen.

In addition to the above subjects, a series of lectures on psychiatry is delivered to the students at the Government Hospital for the Insane, by the Superintendent, Dr. W. A. White; these lectures are supplemented by clinical instruction given by an officer of the Medical Corps.

A series of lectures is also given by an officer of the Judge-Advocate-General's Department on military and martial law, the Articles of War, courts-martial and their functions, purposes and scope.

Each day during the school term, one of the student officers is detailed as assistant to the officer of the day at the Walter Reed General Hospital. The tour of this duty is from six o'clock p. m. until eight o'clock a. m. the following morning. The object of this duty is to familiarize student-officers with military hospital administration.

Graduate candidates who are found physically qualified and who obtain a general average of 80 per cent. in their preliminary professional examination, their course at the Army Medical School, their clinical examination, and their general aptitude, are eligible for appointment in the Medical Corps.

The course above outlined may seem to cover a good deal of ground in the comparatively short time (eight months) allotted to it; the fact that but a small percentage of the candidates fails to complete it successfully is sufficient evidence that its demands are not excessive. It is true, it requires constant application on the part of the student, but unless he possesses the necessary zeal and industry to meet its requirements he is not considered desirable for the military service.

The efficient military medical officer must be not only a good physician and surgeon, but he must also possess adaptability for the service. Men who cannot conform to the varying conditions and vicissitudes of the service, both in peace and war, are but poor soldiers and will fail to perform their duties efficiently. It is the aim of this School to select from the available material the men who best fulfil the requirements.

The general administration of the School is vested in the commandant, who is also the president of the faculty. Subject to the approval of the Surgeon General, he establishes regulations for its interior economy and discipline. The faculty consists of twelve officers of the Medical Corps detailed by the War Department as professors and assistant professors; of these, six are exclusively engaged in the work of the School and its laboratories.

The faculty arranges the program of instruction, prescribes the appropriate textbooks, the allotment of time to each subject, and the character and scope of the examinations, and has final determination of all questions concerning the proficiency of students, subject to the provisions of law, and regulations and orders issued by authority of the Secretary of War.

In addition to the student-candidates for the Medical Corps, medical officers of the Army may be detailed for instruction in special subjects upon recommendation of the Surgeon General. The question of extending the usefulness of the School by the establishment of special courses for officers of the Medical Corps of some years' service, is now under consideration. The benefits to the officers concerned resulting from such an addition to the work of the school are obvious.

Medical officers of the Organized Militia are admitted to the School under the provisions of Section 16, of the Militia Law of 1903, as amended by the Act of Congress of 1908, and under certain regulations prescribed by the Secretary of War. During the sessions from 1909-1913, it had not been feasible to admit this class of officers to the School, owing to the large number of candidates required to fill the vacancies created by the Act of Congress approved April 23rd, 1908, reorganizing the Medical Department of the Army. For the past two years it has again become possible to admit officers of that service.

The course for militia officers commences October 1st, and ends January 31st; it comprises the following subjects:—

1. Military surgery.
2. Medical department administration.
3. Military hygiene.
4. Bacteriology, pathology, and laboratory diagnosis.
5. Sanitary chemistry.
6. Sanitary tactics (including map reading and sanitary service problems).

This course is not as comprehensive as that for the candidates for the Medical Corps of the Army. Practically all of this class of officers are engaged in civil practice, and their interest in military affairs is secondary to their civil work; it would be unjust to demand of them the same requirements that are demanded of men who take up the army as a career. Some are engaged in the practice

of specialties, to whom the special courses given at the School do not appeal. Finally, few are willing or able to devote the time required for the full course.

The course for these officers was therefore arranged with the view of affording them, in the short time available, practical instruction in the most essential features of their duties as medical officers of their organizations.

A militia officer who attains a general average of 80 per cent. in the total rating is given a certificate of proficiency, and the fact is reported to the governor of his state or territory, who is also notified of the position in the medical service of the militia for which the officer is specially qualified.

In addition to the instruction of student-officers, non-commissioned officers of the Hospital Corps are also detailed to the School for courses of instruction in special subjects (bacteriological laboratory work, roentgenology, and photography), to qualify them as laboratory assistants.

The Army Medical School in its laboratories makes chemical, clinical, pathological, serological, and *x*-ray examinations for the military service; manufactures the typhoid prophylactic for the Army, Navy, Militia, and other departments of the government; prepares bacterial vaccines, and conducts such other technical examinations and investigations as may be directed or authorized. It may be of interest to note in connection with this function of the School, that during the year 1914, 502,800 c.cm. of typhoid prophylactic were prepared; that 11,032 Wassermann examinations were made, besides a large number of examinations of blood, sputa, urine, water, tissues, etc.; and that in the *x*-ray and photographic laboratory, over 4,000 radiographs and dental films, besides photomicrographs, negatives, prints, and lantern slides were made.

It will be seen from this outline of the scope and character of its work, that the Army Medical School is a special school whose aim and purpose is to prepare its students for the military service. The well-educated civilian-physician is equally competent to treat the sick and wounded of the military service, but the Army medical officer has additional obligations to fulfil. He is concerned more especially in maintaining the efficiency of the military establishment, and it is mainly towards the accomplishment of this end that the instruction imparted in this School is directed. When this training has been supplemented by actual experience under varying conditions of service, the military medical officer may justly claim to be a specialist in his profession.



## SUPRAPUBIC PROSTATECTOMY.

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It has been aptly said, "He who makes no mistakes makes nothing." When in 1900 Sir Joseph Freyer, in attempting to enucleate a prostate suprapubically and leave the prostatic urethra, accidentally tore across the latter at its apex, he was aghast at what he had done, and watched with much apprehension the outcome of the case. The patient made a straight, complete uninterrupted recovery. This set Freyer thinking. Did he carefully avoid making such a mistake again? By no means. He—surgical genius that he is—with splendid audacity deliberately did the same thing on four or five more patients, with singularly satisfactory results.

The result you are all familiar with—I mean his epoch-making series of publications from 1901 onwards, which instantly established in England the status of suprapubic prostatectomy.

It is, of course, true that Freyer's discovery was only the culmination of a long series of tentative experiments made previously by other surgeons, notably Gill. It is also true that Fuller, of New York, had previously advocated bimanual prostatectomy, making both a suprapubic and a perineal opening; to Freyer, however, belongs the credit of deliberately removing the whole prostatic urethra, and thereby putting total suprapubic prostatectomy on a firm basis.

I have several times used the expression 'complete' or 'total' prostatectomy. This is technically incorrect, for all prostatectomies are strictly speaking 'sub-total,' it being now universally recognized that the surgical capsule of the prostate itself consists of prostatic tissue. For chapter and verse let me refer you to Tandler's and Zukerkandl's excellent article quoted by Wilson and McGrath (*Jour. Amer. Med. Assoc.*, Vol. LVII, No. 20, p. 1601). In this connection much credit belongs to Deaver, of Philadelphia, for repeatedly laboring the fact that it is impossible ante-mortem or post-mortem completely to dissect away the prostate, leaving the prostatic urethra intact.

I have said that in England prostatectomy has been the accepted operation since 1901; there are signs that, in this country also, suprapubic prostatectomy is coming into its own. This

is particularly gratifying to me personally, in that in season and out of season I have persistently preached this gospel here for the last ten years, so much so that I have made the local medical societies weary of the very name of suprapubic prostatectomy, and my friends regard my hobby as almost an obsession. For years in America it has been customary and fashionable to decry this operation, and compare it unfavorably with its great rival, perineal prostatectomy, whose popularity is largely due to Young; but now the pendulum is swinging in the opposite direction. In the 'menus' of the Mayo Clinic one constantly sees the item 'suprapubic prostatectomy,' and Dr. McHugh, who spent some time up there, tells me that the Mayos do practically all of their prostatic work from above. Murphy, of Chicago, told me that he had come



Fig. 1.—Fibrous hypertrophy of prostate.

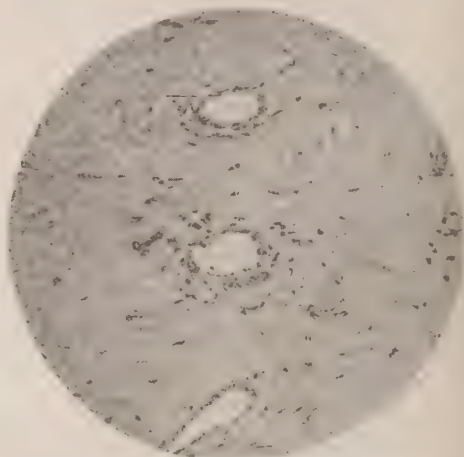


Fig. 2.—Fibrous involution hypertrophy of breast.

to the conclusion that in the large majority of cases it was the better of the two operations, and that he personally was now mostly doing the suprapubic operation.

So much for the history of the operation and its future prospects in America. I firmly believe that it has come to stay and largely supplant the perineal operation made popular by the almost weird technical skill and advocacy of Young.

*Etiology and Pathology.*—These can be dismissed almost in a word. The condition obtaining is an involution hypertrophy exactly analogous to the involution changes obtaining in chronic mastitis of the female breast at or about the climacteric, and for the same reason, namely that the organs have served their purpose and nature has no longer any further use for them. These changes are illustrated by the accompanying microphotographs taken from an article by Dr. F. T. Paul, of Liverpool, published in the *Lancet*,

July 30th, 1910, and reproduced here by permission of the author and the editor of the *Lancet*.

In the past gonorrhea has been advanced as an etiological factor; but almost all men have had gonorrhea, while only 50 per cent. of men over fifty-five years of age have any senile enlargement of the prostate, and of these only 18 per cent. have symptoms troublesome enough to require treatment.

*Preparatory Treatment.*—This consists in giving abundance of water to flush out the kidneys, and getting the bowels well open—in other words, of eliminatory treatment; and in rendering the urine sterile with urotropine, gr. 15 t. i. d. (F. Hinman, *Jour. Amer. Med. Assoc.*, Vol. LXI, No. 18.)

In borderland cases with a low phenosulphonephthalein out-



Fig. 3.—Irritative changes in prostatic hypertrophy.

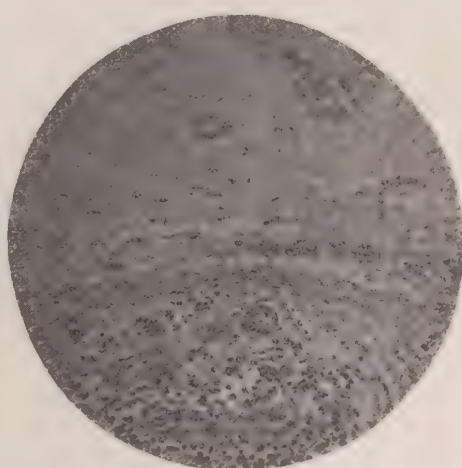


Fig. 4.—Irritative changes in climacteric breast.

put, a two-stage operation can be done, a preliminary cystotomy under local anesthesia, preceding by one or two weeks the prostatectomy; if practicable, regular catheterization for some weeks in all cases in which there is much residual urine is advisable; in cases in which the bladder is over-distended with urine or blood clot, a preliminary cystotomy should also be done.

*Technique.*—I follow Freyer with a few minor exceptions. Chloroform is always used as an anesthetic. It seldom has to be administered for more than five minutes, and frequently one is able to tell the anesthetist to discontinue its administration before the patient is fully under. In these cases, where more or less damage to the kidneys—and usually more—obtains; where marked atheroma is the rule, where considerable bronchitis is very frequent, where short and light anesthesia carried just to the point of relaxation of the abdominal muscles only is necessary, and



where rapidity is all important, I am convinced that chloroform is the preferable anesthetic—this notwithstanding the general leaning in this country towards the almost universal preference for ether as an anesthetic.

The bladder is opened under local anesthesia before the administration of chloroform is begun, or at any rate before the patient is relaxed—such relaxation being only necessary to facilitate the momentary depression by the fist of the anterior abdominal wall during enucleation; the bladder is washed out on the table; the catheter is left in and through it the bladder is sufficiently distended, as seen and felt through the suprapubic incision; the knife is now plunged in, back upwards, and avoiding any large veins, which can be plainly seen in the bladder wall, the peri-

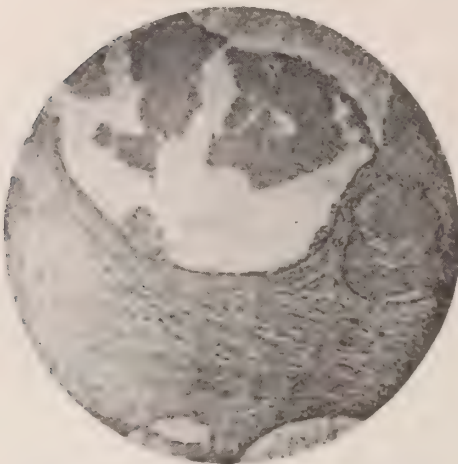


Fig. 5.—Cystic changes with flattening of the epithelium in prostatic hypertrophy.

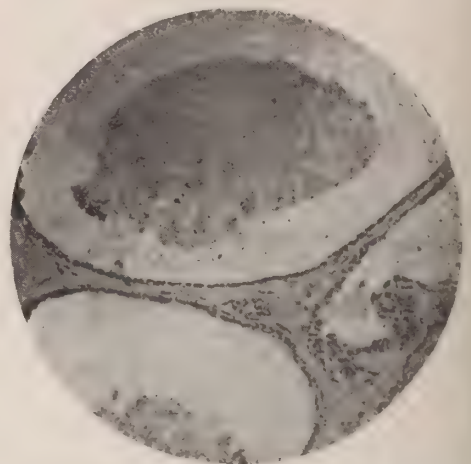


Fig. 6. Similar appearances in mammary involution cysts.

toneum and pre-peritoneal fat being retracted by the forefinger of the left hand; immediately the same forefinger plugs the opening and a rapid intravesical examination is made while the bladder is distended; this tells us what type of obstruction obtains—a middle ball-valve lobe—symmetrical lateral enlargements—a bar obstruction—a general plaque-like induration of the base of the bladder, a big, soft, ripe prostate which we know will easily shell out, or a small, hard, scirrhus prostate which we know will give us trouble; the opening is now enlarged to admit two fingers, a single silkworm gut suture is passed on a curved handled needle on both sides through the bladder wall and all layers of the abdominal wall except the skin, and tied snugly, any stones present are removed, and—while an assistant with finger in the rectum pushes up and steadies the prostate—a straight incision some

three-quarters of an inch long is made with straight, blunt-pointed serrated edged scissors immediately backwards from the internal meatus; if the catheter used to distend the bladder was a soft one, this should be withdrawn previously to the incision. Freyer uses his fingernail instead of scissors, but, like Mayo-Robson, I prefer the technique mentioned, as likely to cause less trauma to the base of the bladder. With the surgeon's own gloved finger or fingers of the right hand now in the rectum, a line of cleavage is felt for with the left forefinger—and here comes the rub. If it is easily and quickly found, we know that the operation will be over inside of two or three minutes; on the other hand, *until* it is found, some anxiety, or perhaps I should say uncertainty, always exists; as sometimes one may have to go much deeper than usual to find the line of cleavage, and sometimes—especially in

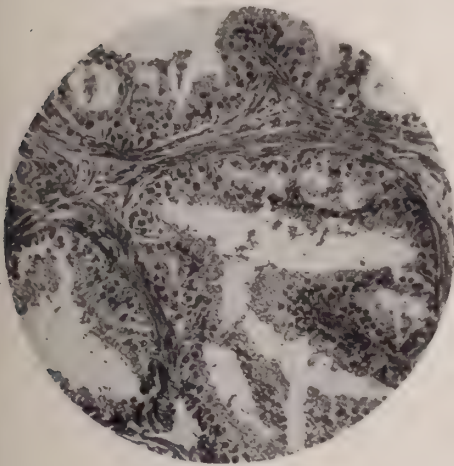


Fig. 7.—Prostatic cysts with hypertrophic epithelium and intracystic vegetations.

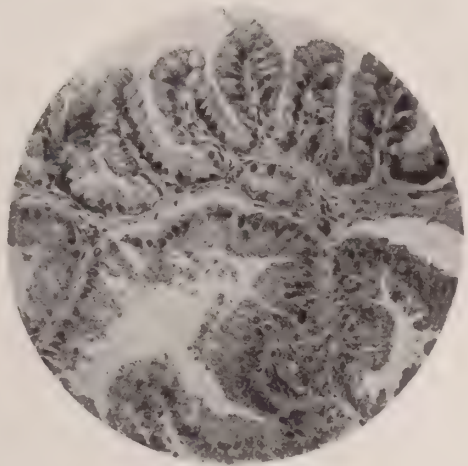


Fig. 8. The same in involution prostatitis.

the small, hard, scirrhus type in comparatively early cases, there is no line of cleavage at all—and that means a punching out piecemeal operation—always a trying and uncertain procedure. There is no criterion by which we can tell in advance whether or not this infrequent and unpleasant condition of things is likely to obtain. You never know till you try (Cuthbert Wallace). This type is the most unsatisfactory one for prostatectomy—suprapubic or perineal—and in my opinion will in the future be more generally dealt with by a transperitoneal punching out operation with the patient in the Trendelenburg position, under ocular guidance.

The line of cleavage being easily felt, the prostate is rapidly shelled out, the final manoeuvre being to sweep the finger across the apex, tearing through the prostatic urethra at its junction with the membranous—of this more anon.

The prostate being now free in the bladder, it is removed whole, or if very large, piece-meal, by forceps, and the cavity left is kneaded bimanually until it contracts down, which it does in a few seconds. I am now accustomed to irrigate the bladder with straight  $H_2O_2$ , followed by hot normal saline solution. A large drainage tube, fenestrated at the bottom, and projecting only one inch into the bladder, is now introduced, and the skin incision closed with two or three silkworm gut sutures, a voluminous dressing applied and the patient sent back to bed; if more than usual bleeding persists after irrigation, the bladder is packed with a two-inch bandage, along side the tube, an ordinary uterine packer being used.

*After Treatment.*—Water is given freely from the first and three pints daily of the acid sodium phosphate lemonade. Urotropine,

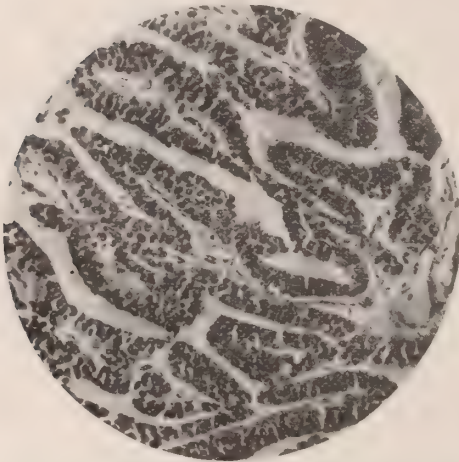


Fig. 9.—Excessive cancerous-like overgrowth of acini in prostatic hypertrophy.



Fig. 10. The same in involution mastitis.

fifteen grains t. i. d. is also continued (F. Hinman, *Jour. Amer. Med. Assoc.*, Vol. LXI, No. 18) and a single dose of morphine gr.  $\frac{1}{4}$  with atropine gr.  $\frac{1}{150}$ , if it has not been given previous to the operation, is now administered; the patient is kept quiet on his back for twenty-four hours with the bed level, unless undue hemorrhage has occurred, in which case the foot of the bed is elevated; after twenty-four hours the patient is changed from side to side every two hours to guard against hypostatic pneumonia, and from the third day—when the discharge is usually no longer blood-stained, the patient is propped up in bed; the bowels are opened by castor oil and enema on the third day, at latest—this is very important, as has been emphasized by Freyer—these cases are very liable to obstinate obstipation; the bladder is irrigated every morning with weak hot solution of  $K_2 M N O_4$  under low



pressure; the drainage tube is removed on the fourth day, also the stay sutures; the remaining sutures are left in for a few days longer if it appears that a chance of healing by first intention obtains; the skin around about the wound is generously smeared with an ointment of zinc oxide and tr. benz. co. one dram of each to one ounce of vaseline, and the sacrum and any other bony points freely painted with tr. benz. co. to prevent bed sores.

The diet for the first few days should consist of milk and Shasta water, with, if necessary, a small amount of Hennessy's brandy; thereafter egg flips, etc.

In old, weakly cases I usually exhibit a tonic:

R	Ferri et Quin. Cit.....	gr. 10
	Liq. Strych. Hydr.....	m. 5
	Elix. Simplex. . . . .	dr. 1
	Aq. Dest. q. s.....	oz. 1/2
	Dentur tales doses.	

Sig., Take after meals, with water.

but strychnine must be used with caution if marked atheroma exists. The patient may be got out of bed as early as the third or fourth day if necessary, *i. e.*, if the tendency to hypostatic pneumonia obtains, especially in the very aged; otherwise I usually keep them in bed until from the seventh to the tenth day; special symptoms, *e. g.*, threatened uremia, etc., of course, require special treatment.

*Prognosis* depends entirely upon the functional capacity of the kidneys—estimated by the phenosulphonephthalein test.

Age has no bearing, in fact the 'ripe' cases, and those who have led a catheter life for some time, do exceptionally well—better often than the early cases. My oldest case was ninety-four years old; he made a straight, complete, uninterrupted recovery and lived for three years afterwards. As far as I know this is the oldest successful recorded case.

The prognosis is of course much better in the large, soft, ripe type of case. The scirrhus type may always mean a punching out operation, the prognosis of which is uncertain, especially as to recurrence of calculi. Finally, while many cases sail very close to the wind, most of them ultimately recover. Specially skilled nursing is absolutely essential. Diabetes mellitus does not necessarily contraindicate the operation. I have had one successful case.

*Dangers and Complications.*—1. *Uremia.* In the future this will be largely eliminated in that a better selection of cases can be made by the phenosulphonephthalein test. Treatment, mag. sulph., etc., eliminative.

2. *Hemorrhage* may occur primarily from the abdominal or bladder wall or from the 'nest' from which the prostate was enucleated; treatment, turning out of clots, H<sub>2</sub>O<sub>2</sub>, repacking, pituitary.

3. *Sepsis*.—If the bladder has been rendered fairly clean and urotropine in doses of not less than 15 gr. T. D. S. been exhibited, this hardly ever occurs.

4. *Hypostatic Pneumonia*.—Careful nursing eliminates this.

5. *Acute Mania*.—A sequela of uremia, from renal insufficiency. I lost one case from this cause on the fifth day.

6. *Acute Suppression of Urine*.—To guard against this attend to the preparatory treatment; do not operate on a dropping phenosulphonaphthalein output; use chloroform as an anesthetic, and if necessary do the two-stage operation.

7. *Subsequent Stricture* may occur when the mucous membrane anterior to prostatic apex carries away (Causation of Stricture Following Suprapubic Prostatectomy, Mills, *Lancet*, July 25th, 1914); in malignant cases; when it has been found necessary to cut across urethra at apex of prostate on account of its extreme toughness.

*Indications for Operation*.—The first time the catheter has to be passed in case of senile enlargement of the prostate, the diagnosis of which I shall have to pass over as time is short, is the cue for operation. I will merely remark that if you run into a large hard prostate which you have difficulty in enucleating, you will do well to examine the same for malignancy—a condition which is not cured and only temporarily benefited by this operation. Senile enlargement of the prostate must be differentiated from prostatismus due to atrophy of the prostate (Howard Somers, *California State Jour. Med.*, October, 1913).

Another indication is phrenitis prostatica (James F. Percy, of Galesburg, Ill., Section on Surgery, Amer. Med. Assoc., 61st Annual Session, St. Louis, June, 1910) which must be differentially diagnosed from senile dementia.

Finally I want especially to labor the following points:—

(a) The phenosulphonaphthalein test has put the prognosis of this operation on a scientific basis. It is no longer a question of guessing how much function capacity of the kidneys, upon which the prognosis is entirely based, obtains. It has been said by a very famous surgeon that "some people go through this world with very few brains and some with no brains at all, but no man can live without an ounce of kidney substance."

(b) The so-called 'senile dementia' with criminal sexual delusions should frequently be labelled 'phrenitis prostatica,' and can be cured by prostatectomy.

(c) *Stricture* may occur, but only in the rare cases indicated where proper after treatment has not been instituted, and in malignant cases; and when it has been found necessary to cut through the urethra at the prostatic apex.

(d) Suprapubic prostatectomy is in the immense majority of

cases the best operation for senile enlargement of the prostate—especially in the large, soft variety; in the scirrhus type the transperitoneal operation will probably displace all others.

*Why is it the best operation? Because—*

1. It is much quicker than the perineal operation, and consequently requires less chloroform.

2. It is much easier than the perineal operation, especially when a large middle lobe is the cause of the trouble.

3. Large calculi can be more readily removed, and encysted calculi more easily dealt with by this route.

4. There is no danger of wounding the rectum in this operation and much less danger of a post-operative fistula persisting.

5. It is a far less severe operation; old men of eighty or ninety do not stand well a long, bloody cutting operation.

6. Incontinence never obtains after this operation, and the potentia coeundi is better preserved after this than after the perineal operation, in fact it frequently returns after it has been lost.

Since writing this paper, two valuable articles have appeared bearing on the subject. One by P. J. Freyer on "Cancer of the Prostate," *Lancet*, December 13th, 1913, in which he advocates his operation in cases of cancer of the prostate supervening on or due to degeneracy in a previously adenomatous prostate, but not in cases in which the cancer preceded the adenomatous enlargement.

The other in the same issue of the *Lancet*, by Russel Howard, of London, details the steps of an original operation by himself for the removal of carcinomatous prostates. The technique of this operation appears to me to be a very great advance on any previously published procedure.

\* \* \* \* \*

It is very gratifying to me to be able to state that my prophesy of December 14th, 1913, has come true, *i. e.*, that suprapubic prostatectomy has in this country also come into its own, and come to stay.

During 1914, the principal medical journals have teemed with eulogistic articles on this subject, among which may be noted excellent papers by Lilienthal (*Ann. Surg.*, Vol. LIX, p. 373), Deaver (*Ann. Surg.*, Vol. LIX, p. 360), Pilcher (*Ann. Surg.*, Vol. LIX, p. 501), and also numerous cases reported in the Murphy "Clinics"; in fact, it may be stated that at this time the suprapubic operation is generally recognized in America as the operation of choice for senile enlargement of the prostate, excepting always in malignant cases and cases of the small, hard scirrhus type.

The phenosulphonephthalein test is still regarded as the best of its type for determining the functional capacity of the kidneys,



but I think the tendency is to regard it as not having altogether fulfilled the brilliant promises which it at one time offered; it is useful, but we do not know to-day what percentage of excretion warrants us in giving a definitely favorable prognosis quâ the functional capacity of the kidneys. Personally I am not satisfied with it and look for a more accurate and reliable test.

Finally the operation is to-day in the same position as was appendectomy twenty-five years ago, *i. e.*, the general public have not yet been educated up to recognizing that it is only a safe operation when performed early. It is still all too frequently put off, often on the advice of the patient's own medical attendant, I admit, until the necessary 'ounce of kidney substance' does not exist. In fact, regarded as a last forlorn hope, and this notwithstanding the fact that even under the relatively adverse circumstances under which it is usually performed, *i. e.*, advanced age and often apparently impending dissolution, the present mortality is only about 8 per cent. This mortality could be reduced, I am satisfied, to approximately 2 or 3 per cent. if the operation were done immediately following the first occasion on which the passage of a catheter became necessary.

## ISCHIORECTAL ABSCESS. FISTULA IN A CHILD TEN MONTHS OF AGE.

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In the present era of preventive medicine, associated with the constant teaching of lessons of hygienic living, it is interesting to me to report this case of an infant who suffered from a preventable affection.

An anorectal fistula is an abnormal channel of communication between the rectum or anus and the surrounding tissues, or the surface of the neighboring skin.

It is of importance to remember that in a large proportion of cases, a fistula has its origin in an abscess cavity, which after having had its purulent contents evacuated either by spontaneous rupture, or by incision, the method commonly performed, collapses to form a tortuous canal, which persists for an indefinite period of time, or at least until surgical interference of the proper character is instituted. These tracts rarely close up of their own accord, due to the formation of fibrous connective-tissue, reinfection, imperfect drainage due to tortuosity of the fistulous tract, and other movements affecting the diseased parts, as walking, respiratory movements and the like. It is a well-known fact that in many ischiorectal abscesses the ordinary pus-producing organisms are found; others have a specific organism as is found in a tubercular or a syphilitic predisposing condition. It is an assured fact that children born of consumptive parents usually possess an increased susceptibility to tubercular conditions, but need not acquire the disease unless infected.

Most fistulæ are seen in the male, probably being due to the fact that they are more likely to be exposed to accidents, and that they are also less likely to pay attention to personal cleanliness as is the female. While fistulæ are more common in middle life, such cases may be seen rarely at a much earlier period, as in the following case.

Male child, *æt.* ten months, began life with predisposing causes which had a tendency to lower his general vitality, and predisposed to the formation of an ischiorectal abscess which was followed by a fistulous tract. I had the pleasure of seeing the patient with Dr. E. Jungmann, the visiting physician. The child was admitted to a Foster Home, in a very debilitated condition, associated with and produced by a severe gastro-enteritis. He was the second child, the first one enjoying apparently good health. The father was twenty-seven years of

age, and the mother twenty-five, both of whom were found to be tubercular about one year prior to the birth of the child. The pulmonary tubercular condition in the father was of a very rapid form, and caused his death about one year after the baby's birth. The mother is still living. The mother was unable to nurse the baby except for a short period after its birth, and it was admitted to the Home suffering from an intestinal toxemia, the result of faulty feeding. It was placed upon a modified milk formula, and did well, nausea and vomiting being greatly relieved with also some slight increase in weight. Several weeks after its admission, it developed in the left ischio-rectal fossa a slightly elevated reddened mass which was painful to the touch and in which later fluctuation could be demonstrated. This mass ruptured spontaneously, leaving a small opening upon the skin surface, from which by pressure, a drop or two of a thin seropurulent fluid could be made to exude. No opening into the bowel was detected. Temperature range was slightly elevated. Surrounding skin surface to fistula was thick and indurated. The general condition of the child slowly improved while in the institution, until the development of the abscess, its rupture and the ever-remaining fistulous tract, after which the child became gradually weaker, emaciation was more rapid, a slight cough developed, and despite the fact that it took and retained its daily amount of nourishment, which dejecta showed to be well digested, died about ten days after rupture of abscess.

This case is of sufficient interest to report, I believe, for several reasons, one of which is the very early age of this patient. While the textbooks tell us that an ischio-rectal abscess and fistula can develop at any age, very few cases are reported in the literature. It was a distinctly local condition. By that I mean it was not secondary to a psoas abscess, not to an adjacent necrosed bone condition. It was tubercular in character, as shown by microscopic analysis, associated as well with a distinct tubercular family history. It is interesting also to note the extremely rapid process in this case as well as the large amount of tissue involved, as was evidenced by the so-called 'barriers set by Nature' as noted by Earle, in which Nature attempts to and does wall off the diseased area and successfully protects the healthy tissues beyond.

Little of interest can be said of the prognosis in cases of this character. In this particular case it was bad from the beginning, as may be seen by the tubercular family history, unhygienic surroundings, and the poor condition in which the child was received, as well as the extreme rapidity of development, followed by as rapid a stage of dissolution.

The condition of the child, when I saw it, did not warrant surgical interference for the relief of the fistula.



## COLLOID CYST OF THE APPENDIX.

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By A. F. TYLER, B. Sc., M. D., of Omaha, Nebr.

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Although the appendix furnishes cause for surgical attack so frequently it is only rarely that the surgeon finds this organ cystic. There are such cases as shown by the literature. That they are not rare, however, is proved by a large series of post-mortem examinations reported some time ago, in which cysts of the appendix were found in 4 per cent. of cases. That the surgeon so seldom sees this type of case is probably due to the fact that cyst of the appendix, as a rule, produces no dangerous symptoms, indeed often does not attract the attention of the patient himself until large enough to be felt through the abdominal wall. Many times this palpable mass has been mistaken for an ovarian cyst, operation proving the mistake. One such case is reported by Thomas Wilson, of London, where the cyst was distinctly palpable, and while bimanual examination was being made the surgeon felt the mass rupture between his hands. No symptom of peritonitis followed, but as the patient suffered from procidentia, she was operated within a few days when the true condition was found. In the reported cases the feminine sex is in the majority.

The largest one thus far reported occurred in the practice of Matas, of New Orleans. This weighed 52.7 oz. and measured  $18\frac{3}{4} \times 17\frac{1}{2} \times 4$  inches. This was not a true hydrops of the appendix, but was a pseudomucinous cyst with the appendix attached to one side.

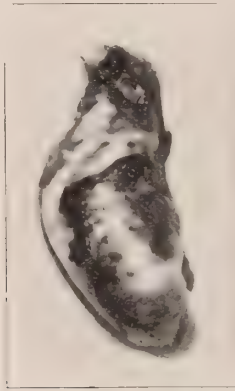
*Etiology.*—Cyst of the appendix is supposed to be due to a band of adhesions shutting off the proximal end or more probably due to the lumen of the proximal end of the appendix becoming obliterated through a low grade inflammatory process. At the same time that this obliterative process is going on, the mucous glands lining the appendix continue their function, causing distention of the appendiceal walls. This process continues until the walls rupture or until surgical attack intervenes.

*Microscopical and Chemical Findings.*—The walls are found to be very much thinned and are composed of fibrous tissue covered on the outside by a layer of peritoneum. The mucous glands still persist, but are more widely separated than in the normal appendix.

The contents of the cyst is of a gelatinous consistency, albuminoid or colloid in character, varying in color from white of an egg

to straw color tinged with blood. Chemical tests of the material prove it to be a pseudomucin.

*Case Report.*—In connection with these notations we wish to present a case which recently came under our observation. M. W. K., a married woman who had borne several children and who had always been well, while working in the harvest field began to have a pain in the right lower quadrant of the abdomen. She was compelled to go to the house and while pressing her side noticed a lump there. She consulted her family physician who thought it a cancer. She then entered an Omaha hospital for diagnosis. On



Colloid cyst of appendix after removal. On the upper part of the left side an incision has been made through which some of the colloid material has escaped.

a meat-free diet, blood was found in the stool. Roentgen examination showed the mass to be retrocecal and slightly movable.

Operation revealed a cyst of the appendix which was retrocecal with the tip pointing upward. It was removed by the usual technique, the patient making an uneventful recovery.

The sac was filled with material resembling white of egg. The walls were pearly white and quite thin. The mass measured 4 x 1 inches at the thickest part, tapering at both ends as is shown in the accompanying photograph.

# MEDICAL AND SURGICAL PROGRESS.

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## FULGURATION TREATMENT OF TUMORS OF THE BLADDER.

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### A REVIEW OF RECENT LITERATURE.

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By HERMAN L. KRETSCHMER, M. D., of Chicago,  
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2. Bacharach (*Folia Urologica*, Vol. VII, p. 685).
3. Bangs (*Med. Record*, April 4th, 1914).
4. Barney (*Boston Med. and Surg. Jour.*, July 3rd, 1913).
5. Beer (*Jour. Amer. Med. Assoc.*, November 16th, 1912).
6. Beer (*Jour. Amer. Med. Assoc.*, May 28th, 1910).
7. Beer (*Med. Record*, February 8th, 1913).
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9. Binney (*Boston Med. and Surg. Jour.*, February 27th, 1913).
10. Bremerman (*Trans. Amer. Urol. Assoc.*, 1911, Vol. V).
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12. Buerger (*New York Med. Jour.*, October 29th, 1910).
13. Cabot (Reports of Meeting New England Branch Amer. Urol. Assoc., 1912-13).
14. Casper (*Zeitschr. fuer Urologie*, 1913, p. 700).
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17. Eaton (*Pacific Med. Jour.*, December, 1912).
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19. Fowler (*Denver Med. Times and Utah Med. Jour.*, 1912).
20. Gardner (*Amer. Jour. Dermat. and Gen-Urin. Dis.*, January, 1912).
21. Harpster (*Amer. Jour. Surg.*, January, 1913).
22. Harris (*Long Island Med. Jour.*, July, 1913).
23. Heitz-Boyer (*Jahrb. fuer Urol.*, 1913, p. 224).
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25. Judd (*Jour. Amer. Med. Assoc.*, November 16th, 1912).
26. Joseph (*Folia Urologica*, 1914, Vol. 8).
27. Kidd (*Clinical Jour.*, 1914, p. 232).
28. Keyes (*Interstate Med. Jour.*, October, 1911).
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33. Kuettner (*Zeitschr. fuer Aerzt. Fortbild.*, 1912, p. 761).
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35. Pedersen (*Post-Graduate*, October, 1913).
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37. Ringlieb (*Verhandl. Deutsch. Gesellsch. fuer Chir.*, 1914).
38. Rubritins (*Jahrb. fuer Urol.*, 1913, p. 226).
39. Schneider (*Zeitschr. fuer Urol.*, 1913, p. 638).
40. Schultheiss (*Verhandl. Deutsch. Gesellsch. fuer Chir.*, 1914).
41. Schwenk (*Zeitschr. fuer Aerzt. Fortbild.*, 1913, No. 15).
42. Smith (*Lancet-Clinic*, 1914, p. 611).
43. Squier (*Med. Record.*, October 5th, 1912).
44. Thomas (*Surg., Gynec. and Obstet.*, April, 1912, p. 315).
45. Uhle (*Annals Surg.*, September, 1914, p. 319).
46. Wolbarst (*Urol. and Cutan. Review*, 1913, Vol. XVII, No. 10).
47. Wossialo (IV Kongress der Deutschen Gesellsch. fuer Urol.).
48. Young (*Jour. Amer. Med. Assoc.*, November 22nd, 1913).
49. Zuckerkandl (*Zeitschr. fuer Chir.*, 1913, p. 2008).

During the past five years the treatment of papillomata of the urinary bladder has undergone a radical change, due to the introduction of a new form of treatment which was first recommended by Beer, of New York. This method was immediately taken up by urinary surgeons in all parts of the country, and it seems advisable to review the literature on this subject with a view to obtaining some idea of the results accomplished, and to ascertain whether or not it possesses advantages over the older methods.

This method is essentially a non-cutting procedure. The open operation for papillomata was a most unsatisfactory one from the standpoint of permanent cures. Recurrences were the rule in a large majority of cases. These recurrences were usually attributed to faulty operative technique, such as careless sponging and handling of instruments and retractors, but undoubtedly a certain percentage of these recurrences were due to tumors having been overlooked at the time of operation.

Prior to the introduction of the high frequency current, what could be offered these patients from a surgical standpoint? I think this question has been well summed up by Kidd, who stated in a recent article on this phase of the subject that, "such a diagnosis (papilloma) meant that you were bound to advise your patient to undergo a suprapubic cystotomy with all its disadvantages, the dread and risk of the operation and the anesthetic, the small but undoubted mortality, the certainty of being in bed for three weeks, and still longer away from work, and even then the chance of a recurrence of the papilloma, and so the need for further operations on the bladder."

It was not at all surprising, in the face of our limitations, that this new form of treatment, which has several distinct advantages and none of the disadvantages of the open operation, sprang into high favor very rapidly, so that to-day it has replaced the open operative treatment, with but few exceptions. The general tone of

satisfaction and intense enthusiasm is marked in all recent publications, having completely displaced any element of doubt which first existed, and naturally would exist with any new form of treatment.

In one of his recent publications, Beer stated that the great simplicity of this new method, the rapidity with which large growths are destroyed, the ease with which any trained cystoscopist can carry out the necessary manipulations, all suggest that it is the method of the future in the treatment of benign growths in the urinary bladder.

Young recently stated that the cure of these apparently hopeless cases by means of the high frequency spark is indeed a brilliant result and shows a great superiority over the method of suprapubic excision in benign cases.

Zuckerhandl thinks that Beer's method of treatment with the Oudin current is a distinct advance over the previous method of removal with a snare. He adds that all intravesical procedures have certain limitations. His addition is quite proper.

Equally enthusiastic is Pilcher, stating that, "especially in dealing with recurrent growths where new growths appear in their original form, or spring from an ulcer base, left after extensive removal of a tumor, we have found the D'Arsonval current to give unexpectedly good results, and to bring about complete recovery when other methods of treatment have failed."

Kretschmer, in his report, stated that the immediate results were absolutely satisfactory in treating the cases of papillomata. The fulguration caused a cessation of the hemorrhages and after a variable number of treatments the tumors completely disappeared.

The results, according to Keyes, obtained from this treatment in papilloma of the bladder, have been most gratifying.

Equally enthusiastic in their writings are Gardner, Bremerman, Uhle, Joseph, Smith (E. O.), Bacharach, Thomas, Harpster, B. Harris, Buerger, and many others, all reporting the same favorable results which have been obtained more or less independently.

After reading the many successful case reports, one is impressed by the scarcity of reports dealing with complications and unfavorable results. This fact is significant for two reasons: First, these successful cases are reported by men from all over this country and Europe. And secondly, this work is the result of a new method of treatment, so that it becomes necessary for each individual surgeon to familiarize himself with its technique. The absence of unfavorable results no doubt is due to careful work and also to the simplicity of the method. The exactness with which this work can be carried out is due in great part to the fact that each and every movement is carried out under the guidance of the eye through the cystoscope.

In a case recently reported by Casper as a profuse hemorrhage after fulguration, one might question the correctness of the statement, because fulguration was not the only intravesical manipulation used. The tumor was first removed with a snare in several sittings, and then the high frequency current was applied. Thirty-six hours later the patient had a profuse hemorrhage.

Schneider reported a case of hemorrhage of very severe character which began two days after fulguration. He believes that these

patients should remain in bed for a few days after treatment and then to avoid vigorous strains, exercises, etc.

To prevent the occurrence of hemorrhage after this treatment, Bacharach does not plunge the electrode *into* the tumor but brings it *to* the tumor.

In a recent article on this subject, Wolbarst made the statement that hemorrhage is quite common after the treatment, but that this usually stops spontaneously after a few days. One does not find so positive a statement,—namely, that hemorrhage is quite common in this form of treatment, in other publications.

In the majority of cases the results are just the opposite, so that patients who have had urinary hemorrhages for many months or even years are entirely free from hematuria after their first treatment. This hemostatic action prompted some of the authors to advise this treatment for the purpose of stopping the bleeding. Thus, Desnos has used high frequency current to great advantage in controlling hemorrhage and Joseph thinks "we should aim to find the bleeding-point and to apply the high frequency current directly to it. Not only does this cessation of bleeding aid in a return of the patient's health and strength, but it also gives one a clear field in which to work."

Kretschmer likewise mentions the fact that in his cases the bleeding ceased after the treatment. Keyes, on the other hand, reports a case followed by profuse hemorrhage.

Among the American genito-urinary surgeons who have worked with this new treatment, the technique employed was usually the high frequency current alone. Among the European urologists, however, one sees a tendency to combine high frequency with some other form of intravesical manipulation. Casper reports cases in which the tumor or most of it was removed with the snare and then the high frequency current used.

Kuettner makes a strong plea for the combined treatment. According to his experience, he believes that the best method of procedure is to remove the coagulated or cauterized parts of the tumor with the snare, as it may be possible that weeks or even months may have to elapse before the necrotic part of the tumor sloughs off. He thinks that it would be dangerous to fulgurate the depths of a growth before the necrotic part has sloughed off.

According to Schwenk, Kuettner's method of treatment is the ideal one.

To anyone who has worked with this form of treatment it is difficult to understand just why a combined method of treatment should be used, or recommended.

Necker believes that the treatments should not follow each other too closely, thereby giving the part of the tumor treated time to slough away.

#### SELECTION OF CASES.

It has been pretty definitely established that the high frequency treatment has its greatest field of usefulness in the cases of papillomata. This fact was recognized very early by Beer, who recommended that it be used only in the benign cases. In one of his early papers he wrote: "I am convinced, after careful trying out, that no malignant growth will be cured by this method. The only



exception I might make would be very small growths that are superficial."

Similar views are held by Schultheiss, who thinks that the malignant tumors with a broad base had better be treated with the knife. He stated that fulguration was suitable and successful for pedunculated tumors.

Judd, in a recent publication, expressed the belief that "the employment of the high frequency current is one of the most useful adjuncts in the treatment of papillomata. No original non-papillomatous growths have been treated by this method." He has found the villous growths on small pedicles the most favorable type for treatment by the high frequency current.

According to Binney, high frequency cauterization is an important addition to our means of attacking vesical papillomata of the non-infiltrating type, and Harpster stated that in non-malignant growths of the urinary bladder this method offers the best and surest means at our command.

It is evident that all working with this form of treatment are agreed on its value in benign papillomata. There are isolated instances, however, in which apparently good results have been obtained in malignant cases, and these will be discussed further on in this paper.

#### RECURRENCES.

Recurrences are notoriously common after the open operation, no matter what type of operation is performed, how the base has been treated or how great was the care exercised in surgical technique. Two possibilities arise for consideration in these cases: (1) One might raise the point of having overlooked small growths at the operation, or (2) patients coming to us with papillomata following an open operation are in reality not suffering with recurrences, but with true primary tumors, and that the particular case under observation is a case of multiple papillomata. This is particularly significant in cases in which the site of the former operation is free from tumor and the so-called recurrence is found in a part remote from the seat of the primary operation.

In cases treated primarily with fulguration, in which the possibility of contact inoculation can be eliminated, the above statement has particular significance.

These so-called recurrences are particularly amenable to the high frequency treatment. Not only have the results been obtained in a much simpler manner and the treatment less frequently followed by further recurrences, but one can always obtain the patient's consent to this procedure much more readily than for a second open operation.

In this connection it may be well to call attention to the value of controlling the patients by regularly carried out cystoscopic examination, for should a recurrence arise, it will be discovered early and can consequently receive the benefit of early treatment.

*Currents Used.*—Two types of current have been employed, the unipolar or Oudin and the bipolar or D'Arsonval. Equally good results have been reported with each kind of current. The Oudin current was the current used by the largest number of men reporting cases. In some of the articles there was no reference to the type of current, the authors simply stating that they used the high

frequency current. In some of the cases both kinds of current were used in the same patient (Keyes).

In his last article on this subject, Beer stated that he uses the Oudin current much more frequently than he does the D'Arsonval. Beer furthermore stated that "there appears to be a slight difference in the way the Oudin and D'Arsonval currents act, when tested on raw beef outside of animal body. The Oudin or unipolar current produces a more marked focal action at the point of application of the electrode, and a less marked though distinct distant action, apparently a cauterization and coagulation. There is also what looks like an explosive action, as pieces are torn or broken off from the growth. On the other hand, the bipolar current has none, or very slight explosive or disruptive action. Its local action is less and its distant action, coagulation by heat, is more marked. By virtue of this, which makes its action less controllable, I believe it inferior to the unipolar or Oudin current for the purpose of destroying papillomata. In view of this distant coagulation and the more extensive sloughing induced, the occasional hemorrhages following the use of the bipolar current seem to be readily explained."

*High Frequency in Cases of Carcinoma.*—As stated above, this new treatment has its greatest field of application in the cases of benign papillomata, and the reports of cases of carcinoma treated in this manner are anything but encouraging.

However, a case of an undoubted malignant tumor of the bladder, reported by Keyes, is interesting and worth mentioning. A small papillary growth was removed from the bladder and proved to be carcinomatous by pathologic examination. It recurred, as was to be expected, but was apparently cured by five burns with the D'Arsonval current, and is known not to have recurred from April 23rd, 1910 to October 26th, 1911.

Suprapubic cystotomy with sparking was used in 4 cases by Squier, 2 of prostatic carcinoma and 2 of vesical cancer. One case of papillary carcinoma and one of carcinoma of the bladder are reported in detail.

Young has recently reported 12 cancer cases treated by cauterization through the suprapubic wound. Three patients are apparently well, and one has a small recurrence. In one case the bladder was freed from carcinoma, but retrovesical metastases are present. Five have died, and two are rapidly losing ground.

#### END-RESULTS.

From a review of the literature on this subject, it is evident that the immediate results are all that can be desired. As time goes on and the cases are controlled by subsequent cystoscopic examinations, we will be able to judge whether or not recurrences are as frequent with this method of treatment as they were with the open operation or whether they recur at all, and, if there are recurrences, whether they recur earlier or later, and whether this form of treatment is less frequently followed by malignant changes in the recurrences.

## DIAGNOSIS OF DISEASES OF THE COLON.

## A REVIEW OF RECENT LITERATURE.

By WM. ENGELBACH, M. D., of the Editorial Staff.

1. Bainbridge: Chronic Intestinal Stasis Surgically Considered. (*New York Med. Jour.*, January 24th, 1914.)
2. Best and Cohnheim: Roentgen Examination of the Alimentary Canal. (*Arch. Diag.*, 1912, Vol. 5, p. 99.)
3. Brown: Alimentary Aberrations; Roentgen Rays as Factors in Their Diagnosis. (*Boston Med. and Surg. Jour.*, December 12th and 19th, 1912, pp. 827, 875.)
4. Burke: Diagnosis of Cancer of the Colon. (*Buffalo Med. Jour.*, October, 1914.)
5. Cannon: Early Use of the Roentgen Ray in the Study of the Alimentary Tract. (*Jour. Amer. Med. Assoc.*, January 3rd, 1914, Vol. 62, p. 1.)
6. Case: X-Ray Studies of the Ileocecal Region and the Appendix. (*Amer. Quart. Roentg.*, November, 1912.)  
X-Ray Aid in the Diagnosis of Carcinoma of the Colon. (*Interstate Med. Jour.*, 1913, Vol. 20, p. 103.)  
Roentgenologic Findings in Malignant Obstruction of the Colon. (*Lancet Clinic*, February 21st, 1913.)  
Roentgenologic Observations on the Functions of the Ileocolic Valve. (*Jour. Amer. Med. Assoc.*, October 3rd, 1914.)
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8. Dickinson: Rectal Palpation in the Diagnosis of Acute Intra-Abdominal Disease. (*Arch. Diag.*, 1910, Vol. 3, p. 138.)
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16. Kellogg: Surgery of the Ileocecal Valve. (*Surg., Gynec. and Obstet.*, November, 1913.)



17. Lefevre: Abnormalities of the Colon, as Seen with the Roentgen Ray; Lantern Slide Demonstration. (*Trans. Amer. Proct. Soc.*, 1914, p. 40.)
18. Morley: Conditions Simulating Chronic Appendicitis. (*British Med. Jour.*, September, 1914.)
19. Pilcher: Pericolic Membranous Films and Bands. (*Annals Surg.*, January, 1914.)
20. Quimby: Chronic Intestinal Stasis. (*New York Med. Jour.*, January 24th, 1914.)
21. Røeder: Movable Cecum. (*New York Med. Jour.*, January 20th, 1912.)
22. Rosenbaum: Roentgenology of the Intestinal Tract. (*New York Med. Jour.*, 1914, Vol. 99, p. 678.)
23. Rotter: Cancer of the Colon. (*Archiv. fuer klin. Chir.*, 1913, Vol. 102, No. 3.)
24. Russell: Chronic Intestinal Stasis; the Value and Limitations of the X-Ray Diagnosis. (*Woman's Med. Jour.*, 1914, Vol. 24, p. 3.)
25. Schwarz: Roentgenoscopy During Irrigation of the Colon. (*Jour. Amer. Med. Assoc.*, 1913, Vol. 60, p. 793.)  
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29. Widerøe: Chronic Intestinal Stasis. (*Norsk Mag. for Lægevidensk.*, January 15th, 1915.)
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31. Wilms: Movable Cecum as the Cause of Certain Cases of So-called Appendicitis. (*Deutsch. med. Wochenschr.*, 1908, No. 41.)
32. Wolff: Malignant Tumors of the Lower Bowel. (*Med. Klin.*, December 31st, 1911.)

The change in the consensus of opinion upon the treatment, particularly surgical, of intestinal stasis is dependent upon the more extended knowledge of the diagnosis of colonic anomalies and diseases. The late intensive studies made both upon primary and secondary diseases of the colon were instigated by the introduction of radical procedures (colectomy, ileosigmoidostomy, etc.) to relieve these assumed colon lesions and their sequelæ. These studies have undoubtedly done much to clarify the diagnosis of intestinal stasis as well as other diseases of the intestines. A perusal of the literature upon this subject presents a decided reaction against this radical surgical treatment. It does more than this, *e. g.*, it helps to give differential information indicating the treatment necessary in a given case. Deaver's references to this subject in a recent address bear the conviction to which investigations of these diseases are tending. He says the writings of enthusiasts in

this line of work would lead to the belief that 'the master-knot of human fate' may be unraveled by surgical alteration of the direction of the fecal current. He urges familiarization with the limitations, rather indications, for surgical application of the advanced ideas on intestinal toxemia, there being a decided tendency to perform operations for the relief of this condition, which in his opinion are unjustifiable. In his experience, the indications for so radical and hazardous a surgical procedure as excision of the colon rarely exist in intestinal stasis, and he found the purpose of the simpler operations, such as short-circuiting or ileosigmoidostomy, throwing the large bowel out of commission, to be defeated by regurgitation of the feces into the proximal loop with impaction, resulting in a condition far more favorable to toxemia than that which existed prior to operation. For these reasons, he looks with little favor on the surgical treatment of intestinal toxemia resulting from stasis, except when such stasis is dependent upon a removable type of mechanical obstruction.

The demonstration or diagnosis of a mechanical stasis, which can be proved to be cause of symptomatology by the exclusion of all other causes, is the only diagnosis which has stood these thorough investigations. General clinical pictures, so-called ptosis, atony, spasticity, anomalous position of the colon, etc., have all been discarded as important evidence of stasis cases. Incompetency of the ileocecal valve syndrome has so far received little confirmation as a pathognomonic lesion. Bands, kinks and veils are not given the importance assigned to them a few years ago.

The following review has included the recent literature upon the technique of examination, *x*-ray, and sigmoidostomy; stasis, ileal and colonic; obstructive bands and veils; mobile cecum; tuberculosis and carcinoma of the colon.

Hænisch states that the bismuth meal introduced by mouth is not sufficient for the *x*-ray examination of the colon. Injections of bismuth through the rectum are essential for this purpose. *X*-ray photography alone is insufficient for a definite diagnosis; the recognition of colonic changes depends in the main upon the observation on the screen during the inflow of the bismuth while the patient is in the recumbent posture; important events in the onward flow of the bismuth are roentgenographed. The following pathologic conditions may thus be demonstrated: anomalies of position, loop formations, dilatations and stenoses, kinks, adhesions, spasms and tumors. Among the stenoses, one may differentiate with some degree of certainty between tumors of the colon, spasms and constrictions due to adhesions. The results of the clinical examination must be carefully considered when the diagnosis is being made. A diagnosis should only be rendered when at least one other examination in exactly the same manner is made at some later date.

Jordan remarks that peristalsis of the large intestine is observed immediately after a bismuth enema, or better still, after introducing fluid into the cecum through a fecal fistula, or the aperture of an appendicostomy; in cases of diarrhea, whether accidental or habitual; in patients who have been taking liquid paraffin; and as a normal phenomenon. A study of this type of cases showed the mechanism fundamentally the same in all, the main difference being in the rate of progress. The more liquid the contents, the more rapidly were they carried on by a contraction wave, and the greater



the distance through which they were carried by each wave. With an enema, or in diarrhea, the rate of passage through the large intestine during a peristaltic wave was four minutes for the complete transit—cecum to rectum; even one or two minutes may suffice. The rate of progress was much slower in the normal cases; two minutes from the splenic flexure to the rectum. The complete passage from the cecum to the rectum in one movement was only seen in cases of diarrhea, or with fluid injections.

Best and Cohnheim state that the *x*-ray examination of the digestive tract does not furnish proper results for all nutritive substances. In the process of meat digestion neither the beginning of gastric evacuation nor the appearance in the colon can be determined. Bismuth exerts certain influences upon the small intestine, which consist in a retardation of the passage of solid and fluid contents through the small intestine and the delay of gastric evacuation. Barium sulphate does not seem to possess these qualities.

In writing upon the technique and therapeutic use of sigmoidoscopy, Jackson suggests in certain cases a marked choice of positions. He says that sigmoidoscopy properly conducted, *i. e.*, preferably in the knee-chest position or in the nearest possible approach to it, reverses the conditions productive of the above troubles. As in the Trendelenburg position, the pelvis is emptied of all but the fixed organs, and they are pulling away from rather than pressing upon the pelvic floor. And if gravity alone is not sufficient to this end, atmospheric (often alone quite effective) or pneumatic pressure, admitted through the sigmoidoscope, and intelligent manipulation of the instrument, may accomplish the desired effect. The result may be the unfolding of kinks, coils, angulations and invaginations, unless they have been of sufficient duration and intensity to bind the bowel by inflammatory adhesions in its abnormal position. Foges recounts a case where, in the course of an examination which determined the diagnosis of invagination, the same was disinvaginated by the instrumentation. He reports 2 cases which were too ill to be placed in the knee-chest attitude, but a very exaggerated Sims position was used. In Case I the digital examination showed the sigmoid beginning to invaginate into the ampulla, which was more evident on visual examination and disappeared with the upward passage of the sigmoidoscope. Recurrence of the symptoms was relieved by the same treatment, and permanently. In Case II the instrument passed the sigmoidorectal juncture with great difficulty, but beyond that with comparative ease. He questions whether it was the passage of the angle at this site or the insufflation of air beyond the extreme point of introduction, distending and relieving some unseen kinking or invagination, that caused the deceptive tumor to disappear.

Bainbridge says that his seven years' personal experience, combined with his studies of Lane's cases before, during and after operation, has led him not to hesitate to short-circuit the colon or colectomize, where less radical measures will not suffice. He agrees with Lane that to cut bands and to disturb many adhesions may give, in markedly toxic cases, as great or a greater mortality than the radical operations. He classifies chronic intestinal stasis under three groups. The first, he calls the medical group. In this, surgery is not indicated. It is relieved by hygienic measures, posture,



diet, special exercise, liquid paraffin and properly fitted belt. The third group requires a short-circuit operation or a colectomy. The second group requires a repair of the drainage system, usually less radical than that of the third. In this article he takes up only cases of the second group. Hayes, in the following paragraphs, gives the medical findings and Quimby the radiological findings on these cases. Seven cases are reported, giving the findings before, during and after operation. By these, he endeavors to demonstrate the existence of various conditions which cause, and the results produced by, chronic intestinal stasis. He shows that it is very important to study particularly the *x-ray* plates of the fluoroscopic findings made before operation, for after the patient is thoroughly prepared for operation and the abdomen opened, kinks and angulations which have produced stasis may not be apparent in the empty gastro-intestinal tract in the prone position. When in the upright posture, or in the reverse Trendelenburg posture on the table, if the organs are carefully held up, the constricting bands and the resulting kinks become far more apparent. This mechanical fact perhaps explains some of the difficulties experienced by many surgeons in finding these obstructions. The added experience, however, with these changes borne in mind, has practically eliminated the doubt in his mind concerning the existence of these 'crystallizations of lines of strain.'

The clinical observations of Hayes on chronic intestinal stasis led him to conclude that the marked symptoms have been weakness, loss of weight, headache, nervous irritability and emotional states, lack of concentration, drowsiness, insomnia, poor circulation, palpitation, with cold hands and feet, constipation, soreness of joints; and in those cases with gastric complications—bad taste, belching, regurgitation of food and acid fluid, erosion of the teeth, pain between shoulder blades, nausea and vomiting. Ulcer near the pylorus has been a rather frequent complication. The marked physical signs have been pallor, with or without anemia, a sallow color or slight pigmentation of the skin, cold moist hands and feet, and the following abdominal signs, which are very constantly present in these cases, and taken together with the toxic symptoms make the diagnosis exceedingly simple, *viz.*, (1) dilated duodenum shown by a marked tympanites in the area behind the right rectus muscle to the right of or posterior to the pylorus and lying between the liver above and the transverse colon below. The dilated duodenum is readily marked out by the employment of percussion with pressure. Owing to the kinking of the duodenojejunal junction, the duodenum is found to be distended with gas, often two or three fingers in diameter. This duodenal inflation is frequently associated with gastric stagnation or distention. (2) Pressure paradox: in cases showing a dilated duodenum, pressure is made backward and upward for about thirty seconds by the hand placed just below the umbilicus, the patient being in a semirecumbent or reclining position. It might be thought that this would increase the amount of gas present in the duodenum; on the contrary, in the type of case we are considering, it will usually result in the undoing of the duodenojejunal kink, permitting the duodenum to empty itself, as shown by a relatively dull percussion note or marked diminution in the size of the tympanitic area. At the same time, it is often possible to hear and feel the gas escape as it rushes into the jejunum.

It might be thought that lying down would be sufficient to undo the duodenojejunal kink, but frequently this does not follow. (3) Inflated ileum, shown by a marked tympanitic note (sometimes a high-pitched note, quite characteristic of gas under pressure in a small tube) to the left of and below the cecum. (4) Corded colon. Frequently the left iliac colon is felt as a rope-like body directly beneath the abdominal wall. This is apparently due to spasm of the portion of bowel just above the sigmoid flexure and is commonly found in the stasis cases. To what degree this condition should be considered abnormal is debatable. Hayes says the treatment in the great majority of cases should be medical, which treatment he gives in detail. In the marked cases which fail to respond to this treatment, surgical treatment is indicated, providing the patient has sufficient resistance to render success probable.

Quimby takes up the technique of examination and the demonstration of the site of mechanical obstructions in minute detail. He covers the entire gastro-intestinal tract in his discussion, and gives skiagraphic illustrations of many of the important lesions. He broadly divides the obstructions into simple mechanical obstructions, simple obstructions combined with organic changes, and organic obstructions without mechanical phenomena. The simple mechanical obstructions occur where the suspending ligaments or attachments of the bowel, when the patient is in a favorable position, exerting a greater traction at a given point, cause this hollow tube to bend upon itself in such a way as to decrease its calibre sufficiently to inhibit peristalsis and retard the onward propulsions of its contents. The mechanical obstructions combined with organic changes consist of those cases in which we find bands, contractions, adhesions, and mucous ulcers, at a point which is a common location for the simple mechanical class. In addition, in this class of obstructions where adventitious supports, as mesenteric and peritoneal bands, having assumed the functions of the normal supporting ligaments. Organic obstructions without mechanical aid are usually the result of an external inflammatory process transmitted to the bowel wall, causing connective tissue formation and contraction; or they may be secondary to an ulcerative process originating in the mucous membrane or peritoneal covering, as in typhoid fever, ulcerative colitis, malignancy, and the various types of peritonitis.

Cole maintains that the majority of cases of ileal stasis do not at operation show adhesive bands or kinkings of the terminal ileum. Since 1910, he has been urging incompetency of the ileocecal valve as the essential cause of ileal stasis. Incompetency of the ileocecal valve is an essential factor in the production of ileal stasis even in cases where ileal kinks do exist; in other words, adhesions of the ileum very seldom produce actual obstruction. Since 1910, he has seen in his roentgenological practice more than 500 cases of ileocecal valve incompetency out of more than 3,000 individuals examined by the bismuth meal and bismuth enema. His studies led him to believe that the ileocecal valve is normally competent and that the competency is due to an action of the valve lips which is largely, if not entirely, mechanical, the evidence being summarized as follows:

(1) The ileocecal valve is almost universally present in vertebrate animals, and at least in the dog, the pig, and the cat the valve



is competent to the enema, notwithstanding enormous distention of the colon by fluid and gas. (2) By means of a string passed through the alimentary canal, traction may be made upon the valve lips producing temporary incompetency. (3) In about one-sixth of 3,000 individuals, most of them constipated and all suffering from gastro-intestinal disturbances, the bismuth enema passed the ileocecal valve, filling the terminal ileum for varying distances. (4) The valve incompetency thus determined is a constant phenomenon in those cases. (5) Patients with incompetent ileocecal valve describe characteristic disagreeable symptoms apparently due to the passage of the enema into the small intestine. (6) In marked cases there is also observed a reflux of ingested bismuth from the colon into the ileum. (7) The occurrence of the incompetency is to a large degree, at least, independent of the temperature or composition of the opaque enema. (8) The incompetent ileocolic valve may be restored to competency by a simple surgical procedure, the competency continuing at the present date in cases operated on a year and a half ago. (9) In operations upon patients with incompetent ileocolic valve the small bowel is found filled with gas to a very disturbing degree. (10) It is possible in the operation of ileosigmoidostomy to construct an efficient artificial ileocolic valve (Kellogg's operation) which will successfully act as a barrier against reflux from the colon. (11) There are definite deviations from the normal anatomical structure found at operation on cases of ileocecal valve incompetency. (12) Post-mortem studies show the ileocolic valve to be competent in the great majority of cases.

Kellogg, in an article too lengthy to review, takes up the embryology, anatomy and pathology and the surgical treatment of the ileocecal valve. In the same article, he discusses the artificial production of valve formations in operative procedures anastomosing the large and small intestine. He reports 66 cases of incompetent ileocecal-valves operated on with satisfactory results. In every case of pre-existing ileal stasis it was found to be notably diminished and, with the exception of two or three, the ileum was found to empty itself within the normal time, or in less than ten hours.

Widere reviews his experience with 23 cases of intestinal stasis in his service since 1912. The ages of the patients ranged from seventeen to seventy-one and all but 5 were women. An operation was deemed necessary only in 3 cases, and in these the appendix and the genital organs were found normal, but the cecum was very large and loose, with adhesions. In 16 cases the family physician had sent the patient to the hospital urging immediate operation, but in all the trouble was merely chronic intestinal stasis. Widere reviews the various disturbances which stagnation of the feces is liable to entail; he also analyzes the various factors liable to cause the chronic stasis, citing the details of a number of cases. In his own experience the patients paid no heed to their chronic constipation, and did not mention that intervals between stools of from two days to eight days were the rule. In 2 cases there were symptoms of incipient peritonitis and in another an attack of colic. In 4 cases the vague pains in the stomach, back and lower abdomen with dysmenorrhea led to the diagnosis of gynecologic trouble. In 2 others dyspepsia was the main disturbance. Roentgenoscopy may be necessary in case a kink or band is suspected as the cause of the constipation. Mothers should be warned that children may be con-



stipated even with a daily passage and that this tendency to constipation may increase as they grow up, especially in girls. They must be taught to heed the slightest impulse to defecate and be trained in regular habits in this respect. A few gymnastic exercises, including deep breathing, with a bland diet, will generally regulate bowel functioning in the young. At all ages, the food should contain nothing to irritate the bowel, no alcohol, coffee, sharp condiments, etc., and tobacco should be used sparingly, if at all. Mayr advises exercising the abdominal and trunk muscles three times a day by deep breathing, by rising from the horizontal to the sitting position without the use of the arms, bending the trunk forward and back and sideways during deep breathing, and bending the hip and knee, standing on the other foot. Widere adds that half a glass of cold water, fasting in the morning, with or without half a teaspoonful of cooking salt or Carlsbad salts may prove useful. Liquid paraffin is found of great benefit in some cases. It is not absorbed, he says, while it is not toxic in the least. It acts mechanically and has never failed him. The dose is one or two teaspoonfuls three times a day on an empty stomach. It has no taste but the oily consistency is repugnant to some; if so, it can be shaken up with a little water into a fine emulsion and be flavored with lemon juice.

Holding, in a forceful paper emphasizing the diagnostic errors of colon diseases, says that in no class of patients have errors of interpretation been greater than in many so-called cases of intestinal stasis, often only pseudo-intestinal stasis. The time schedule of the stomach and intestines is not unvarying, and purely emotional conditions or variations in diet will frequently affect it within wide limits. A current belief is that only the first portion of the duodenum is clearly visible normally, whereas he has frequently seen the outlines of the whole duodenum in healthy individuals. The fact that the terminal ileum, containing bismuth, makes a distinct angle with the cecum is not characteristic of intestinal stasis, Lane's kink, or other unusual condition, but is the normal course of the ileum, shown in most healthy individuals from four to six hours after bismuth ingestion and not necessarily pathognomonic of disease when the outlines of the ileum remain visible for several hours. Roentgenograms of the normal colon show the cecum and ascending colon much larger in diameter than any other part of the colon, while the lumen of the descending colon at its junction with the sigmoid flexure is relatively small. This is not pathology, but physiology. Much of the still liquid contents of the cecum and ascending colon are reabsorbed into the general system, a striking reservoir action in the cecum. In atonic constipation, cecum and ascending colon become greatly distended and the bowel contents often stagnate along the walls of the cecum, probably a potent factor in auto-intoxication. Dilatation of these parts also occurs in cases of spastic constipation of the transverse and descending colon.

Dilatation with intestinal stasis always means pathology. The three cardinal signs of real intestinal stasis are dilatation of the bismuth-filled viscus, local or relative fixation, and a marked delay in the progress of the bismuth column. This rule holds true in intestinal stasis caused by tumors, but with the visible defect in the bismuth outline, usually more definite than where caused by adhesions, 'veils,' or membranes. Real adhesions more often present

where chronic inflammatory processes commonly present, as in the region of the appendix, or gall-bladder, or, particularly in women, in the pelvis. Ptosis of the hepatic flexure is common without symptoms, and the transverse colon is normally so freely movable that unless definitely fixed in an anomalous position, associated with distention and material stasis, it does not indicate a lesion other than ptosis. Reverse peristalsis in the colon is a physiological phenomenon, not a sign of obstruction. The outline of the lumen of the appendix is not pathognomonic of disease unless angled, fixed or distended, or unless retaining bismuth for more than twenty-four hours after the remainder of the bismuth meal has left the cecum.

Skinner concludes that pericolicitis dextra (Jackson's membrane) is generally conceded to be a distinct mechanical lesion with a definite clinical symptom-complex, and a definite Roentgen symptom-complex, which, theoretically, should be: (1) Stomach may show slight ptosis, but should be absolutely free from organic lesions; (2) duodenum normal; (3) stasis of the proximal colon as far as first portion of the transverse colon, which may persist for days; (4) dilated cecum with possible fixation of the appendix acting as a suspensory ligament; (5) fixation of ascending colon with tenderness and pain referred therefrom, and frequently one or two distinct annular constrictions near the flexure in the ascending colon; (6) spasticity of descending colon with increased anti-peristalsis of colon and mucous shadows indicating colitis; (7) if the condition is of long standing, there may be ileocecal patency and general visceroptosis with the exception of the hepatic flexure; (8) the one startling Roentgen finding is the constancy of the bismuth shadows in the proximal colon, which remain almost identical for days and do not alter very perceptibly when patient is changed from the horizontal to the vertical position.

Pilcher is of the opinion that enough clinical observation has accumulated to confirm and emphasize the statement that right-sided pericolic membraniform veils and bands, crippling the peristaltic function of the cecum and ascending colon, are of frequent occurrence, and that when present, they, in many cases have been the cause, and may in the future be a cause of much ill-health and suffering. Therefore, in any operation involving the right side of the abdomen, he advises that the incision be so planned as to make it possible to explore for their presence and do whatever is necessary for their removal.

Morley is of the opinion that the peritoneal band described by Lane probably never gives rise to trouble, so that the many ingenious contrivances devised for dealing with it are the outcome of misdirected enthusiasm. Jackson's pericolic membrane, on the other hand, may give rise to symptoms simulating appendicitis. A mobile proximal colon is predisposed from birth to chronic constipation, and symptoms resembling chronic appendicitis may thereby result. The commonest cause of erroneous diagnosis of chronic appendicitis is right tubo-ovarian disease, often of gonorrheal or septic origin. A spasmodic contraction of the right psoas muscle sometimes occurs, and on palpation may be mistaken for an abscess or neoplasm.

In a recent article which comprises a material of 40 cases, Wilms declares that a normal appendix is very frequently presented by



patients who have arrived on the operating table under the diagnosis of chronic appendicitis. After recovery from the operation for the removal of the appendix, the same symptoms present before the operation recur. In these cases, according to Wilms, the appendix really was not at fault, but instead, an abnormally long movable cecum which caused symptoms, mainly by dragging on its mesentery and on the mesentery of the appendix. In these cases, Wilms recommends, instead of appendectomy, an operation for the fixation of the cecum, which he maintains produces exceedingly favorable results. In this article, Wilms does not attempt the diagnosis of this condition, except that based upon the findings after the abdomen is opened.

Røeder maintains that a movable cecum may be productive of symptoms resembling chronic appendicitis. A high cecum may be a movable cecum producing symptoms. On finding only a kinked appendix and a pronounced anterior ileocecal fold, a prolapsed cecum and a Lane kink may be present. Constipation produced by a prolapsed cecum may be due to traction on the narrowing of the ileocecal valve. Some cases of pylorospasm may be due to narrowing of the ileocecal valve by traction of the cecum.

Schwartz's method of diagnosing a movable cecum is as follows: Reider's meal, containing 40 grm. bismuth, is given by mouth and the patient examined seven hours afterward before the fluoroscopic screen, the bismuth having reached the cecum and ascending colon. At this time in many cases, the mobility of the cecum can be demonstrated by palpation; in other words, by actually moving the cecum to different positions in direct observation by means of the screen. In some individuals, this method may be a possible source of error on account of the varying intra-abdominal tension and the variable thickness of the abdominal wall. For such cases, he has another method to determine the mobility of the cecum. This consists of an orthodiagram in the direct posture, an orthodiagram in the left lateral posture. In the latter of these, the cecum, in accordance with its weight and mobility, has a tendency to descend towards the middle line. In the lateral position, the cecum does not extend at all or extends slightly towards the median line, but moves freely up and down. He gives a number of illustrations graphically describing this method.

Stein, writing on the symptomatology of tuberculosis of the cecum, states that the onset of both varieties of cecal tuberculosis is very gradual. The early symptoms are slight pain in the lower abdomen and irregularity of the bowel function. Some cases have diarrhea, others continuous constipation, or the diarrhea may alternate with constipation. Obrastzoff thinks the diarrhea may be an indication of involvement of the small intestine with a catarrhal and not necessarily a tuberculous condition. The pain, at first of a dull type or a sensation of weight, later becomes more severe and localized in the right iliac fossa. Nausea and vomiting are sometimes complaints, and loss of flesh may occur early in the disease. Evening rise of temperature has been noted, but some observers claim that it is due to the primary tuberculous lesion in the lung and do not find any temperature in the cases of primary cecal tuberculosis. As soon as the hypertrophy of the cecum produces partial obstruction, the patient complains of paroxysms of colic situated in the right iliac fossa, radiating to the hypogastric, epi-



gastric and umbilical regions, or down the right thigh. These paroxysms occur without any apparent cause. In most cases the intake of food does not give rise to the colics, which may last from hours to days and are often preceded by constipation. The intensity of the pain and the frequency of recurrence vary considerably. The interval may be absolutely free from pain or associated with tenderness of the organ and its immediate surroundings. These paroxysms of colic are usually followed by diarrhea, owing to the irritation of the mucous membrane by the fecal stasis. Some cases, however, have diarrhea synchronously with colic.

The symptoms increase with the obstruction. Abdominal distention and visible peristalsis become apparent. Palpation of the right iliac fossa will at this time elicit tenderness, rigidity and a tumefaction. The intestine should be thoroughly emptied before the examination, at which time the cecum is held down in the right iliac fossa with the left hand, while the right hand palpates the tumefaction. In determining the seat of the lesion as being in the cecum, palpation of the ileum is very important. Normally, the lower edge of the cecum is one centimeter above the interspinous line. In tuberculosis, owing to sclerotic changes and contractures, the lower edge of the cecum rises 3 to 4 cm. The ileum can then be palpated as a cylinder running for about 8 to 10 cm. in almost a vertical line. In the presence of ileocecal stenosis, the ileum becomes hypertrophied, lies nearer the anterior abdominal wall, and thus permits of peristalsis being observed. Exceptionally, the cecum may lie 3 to 4 cm. below this line, in which case the ileum can only be palpated for a very short distance and runs more nearly horizontal. The mass varies in size, depending on the extent of involvement of the surrounding tissues. Its shape may be round, oval or elongated if the ascending colon is included in the pathological process. The cecum usually maintains its form and outlines, though enlarged generally. The greatest infiltration is felt at the lower pole, gradually diminishing toward the ascending colon, which is palpable as a distended tube.

The surface is usually irregular and firm, adherent in the enteroperitoneal type, but movable in the hypertrophic form; in fact, the cecum remains movable as long as the peritoneum is not involved. Ballottement is sometimes obtained. The tumor rarely reaches Poupart's ligament; internally it may extend to the external border of the rectus and externally to about two finger-breadths from the iliac crest. Percussion elicits various data, depending on the thickness of the wall of the cecum, its contents, its nearness to the abdominal wall, and the presence of loops of small intestine anterior to it. Ordinarily a dull note is heard at the center of the tumor, becoming tympanitic towards the periphery. By rectal and vaginal examination the cecal tumor or enlarged mesenteric glands may be palpated.

Indicanuria is often present and the Diazo reaction is positive in a majority of the cases. Complete intestinal obstruction rarely occurs. Hydronephrosis from pressure on the ureter has been reported.

The last stage of the disease is characterized by abscess formation, usually of chronic type and seldom associated with temperature elevation. Fistulæ communicating with the abscess supervene most frequently in the right iliac fossa, but sometimes in the lumbar

or umbilical region or near the anus. Occasionally the abscess is of the acute type simulating an abscess of appendiceal origin. Bacteriological examination of the pus may demonstrate the presence of tubercle bacilli and the pyogenic bacteria. In some cases an acute perforation occurs before a preliminary tumor has formed. This may result in acute general peritonitis or a local abscess which may terminate in the formation of a fistula. The lymph-nodes in the right iliac region may be sufficiently enlarged to be palpable.

The examination of the feces may not show any gross abnormality except the presence of a large amount of mucus. This is not infrequently indicative of involvement of the ascending colon. In many cases, and especially in the later stages, blood in the fresh state or more frequently dark or disintegrated, occasionally pus and membranes, are encountered. The frequency and ease of finding tubercle bacilli in the stools vary according to the statistics of different authors. According to Hemmeter, they are very difficult to find in old cases. Obrastzoff, in 5 cases, not only got positive results, but was successful after a very short search in almost every specimen. The bacilli in his cases were quite numerous. As microscopic examination of the diseased tissue has only shown tubercle bacilli in 50 per cent. of the cases, we can hardly hope to obtain a positive bacillary finding in every stool examination. The mucopurulent masses in the stools are the most liable to contain the bacilli, but they may also be found when the excrements are well formed. The occurrence of tubercle bacilli in the stool does by no means imply the existence of a tuberculous lesion of the intestine. German observers place very little significance in finding tubercle bacilli in the feces as pointing to a tuberculous enteritis. Tubercle bacilli may be found in the stools of many patients with pulmonary tuberculosis. Furthermore, tubercle bacilli have been demonstrated in the feces of individuals who were not suspected of having had tuberculosis in any part of their body. Only a few of these showed involvement of the peritoneum or intestinal mucosa at autopsy, but all gave evidence of tuberculosis in some portion of the organism. In many, the lymphatic glands alone were infected. Obrastzoff considers the presence of tubercle bacilli in the stools, together with the findings of an indurated cecum, comparable to detecting tubercle bacilli in the sputum of a patient having bronchial breathing and impaired resonance at the apex of the lung. According to the same author, every case of an infiltrated cecum had tubercle bacilli in the feces, which, however, is contradicted by the author.

Out of 100 cases of intestinal tuberculosis that came to autopsy, Walsh found among the cases showing tuberculous ulceration of the cecum alone, that in one case tenderness and rigidity were elicited, in one tenderness alone, in 2 rigidity alone, and 2 complained of no symptoms at all. All other possible combinations of the usual symptoms, pain, diarrhea, tenderness and rigidity, that is, diarrhea, pain and tenderness; diarrhea and pain; diarrhea and tenderness; diarrhea and rigidity; pain and tenderness; pain and rigidity; diarrhea alone; pain alone had not been noted in any of the other cases of cecal tuberculosis.

The differential diagnosis of cancer of the colon, according to Burke, can best be considered by a study of the flexures, situations where the growths most frequently occur. Beginning at the cecum,



two pathological conditions are found that can simulate carcinoma—appendicitis in old people, and ileocecal tuberculosis. There are cases in which the differential diagnosis between cecum carcinoma and appendicitis in the beginning gives rise to great speculation, when there exist elevation of temperature and sometimes repeated chills, as well as acute local pain. But here, as well as in all cases, the taking of a very careful previous history up to the time, and exact detailed symptomatology of the present illness ought to be of great diagnostic aid. Some observers have claimed that temperature in itself speaks against carcinoma, but in this they absolutely err, because temperature elevation is not a seldom phenomenon in gastro-intestinal cancer. Fromme, of Halle, claims that this fever in cancer is due to destruction of the primary tumor, large lymph channels being opened up, and a great amount of bacteria brought to the lymph-glands and their toxins permeating the blood. Hence he would suggest in the differentiation of bowel carcinoma from appendicitis in elderly people, that we pay absolutely no attention to the temperature as against carcinoma, but rather depend more on the previous history of the patient. However, both conditions demand early surgical attack, and one who opens the abdomen to operate an appendix ought to be ready to do a radical operation in case his pathology proves to be a cancer. Yet a perfect diagnosis of carcinoma would permit a few days' preparation, and the advantage of a few days' toning up.

According to Case, Roentgen findings in carcinoma of the bowel may be stated as follow: (1) Delay in the onward progress of the bismuth column following a meal of bismuth-mixed food. The nature of this interference varies with the location of the lesion. For instance, in cases of carcinoma of the hepatic flexure of the colon, the entire residue from a bismuth meal may crowd into the colon proximal to the lesion, with no marked ileal stasis resulting. This stasis in the colon may vary from forty-eight hours to several days. In some cases the obstruction may be complete. Cleansing enemata ordered to dislodge the stagnant bismuth-mixed residue are less and less successful, according to the degree of stenosis. Often the cleansing enemata fail to ascend the colon beyond the tumor. (2) The introduction of a bismuth clysma into the colon shows a characteristic arrest in the progress of the bismuth column, a hindrance which may be complete or may be overcome in a long or a short time according to the degree of stenosis. It is not out of place to urge that the technique of Hænisch be followed to the very letter, if one hopes for reliable results. The head of the enema column, when it reaches the point of obstruction, may present a funnel-shaped shadow, after which the further filling of the bowel may be impossible, or the bismuth column may after a time again dilate to its normal width. After some delay, the entire bowel may become filled except at the site of the stenosis. When, as is the case in stenosis of the ascending colon, the bowel on the proximal side is not filled completely, but presents an irregular, cauliflower-like shadow, care must be taken to eliminate the possibility of this appearance being due to insufficient pressure failing to force an adequate amount of bismuth suspension through the stenosed segment of intestine. Filling defects in the bowel shadow, similar to those produced by carcinoma, may be caused by fecal tumor, to which the term fecaloma has been applied by certain French



writers. The source of error may be excluded by making sure of the thoroughness of the bowel cleansing previous to the examination. (3) A dilatation on the proximal side of the lesion. This dilatation is not necessarily great and may not be demonstrable during the *x*-ray examination. When present, it is evidence of a serious obstruction. The colon shadow may end at the obstruction in a funnel-shaped process, or there may be an irregular filling defect characteristic of a cauliflower carcinoma. (4) There may be a palpable tumor coinciding with the filling defect. A palpable tumor may not be present, and it hardly would be expected as a constant finding if one hopes to make a diagnosis which is comparatively early. It should be borne in mind, also, that palpable tumors in connection with bowel carcinoma may really be fecal accumulations. At times the dried fecal accumulations in the intestine, proximal to the seat of obstruction, may assume a degree of hardness and resistance to palpation equal to the tumor itself. One would hardly expect to palpate a tumor, even if present, if it occupied the distal leg of the sigmoid or that portion of the colon which lies above the costal margin. The mobility of the tumor varies, according to the length of the mesentery and the degree of pericolic involvement. Transverse colon and sigmoid colon tumors usually possess the greatest degree of motility, and yet cases of carcinoma of the cecum and ileocecal valve have been seen in which the tumor was exceedingly freely movable. The writer believes that the presence of a palpable tumor should be considered a Roentgen sign, inasmuch as the palpation under the fluorescent screen is obviously superior to the ordinary method of palpation. (5) The author wishes to call attention to what he believes a valuable sign in the diagnosis of serious colon obstruction, *viz.*, exaggerated antiperistalsis. The prevailing movement in the proximal colon, that is, the cecum, ascending colon and the right half of the transverse, is antiperistalsis, as has been shown by Cannon and others. The author does not refer to this normal antiperistalsis as a sign of bowel obstruction; but when the normal retrograde waves are exaggerated, this fact may be considered a sign of obstruction, analogous to the observation of antiperistalsis in the stomach in cases of pyloric stenosis. The bismuth mixed colon contents may be found distributed in two zones, a large collection in the distended cecum and ascending colon and a series of bismuth masses in the distal colon, proximal to the obstruction, which, on repeated examination, is seen to be in a state of peristaltic unrest, onward and retrograde peristalsis alternating. The administration of laxatives previous to the examination is likely to increase the probability of observing antiperistalsis. It should not be understood that the foregoing sign is found only in malignant obstructions. Any kind of bowel obstruction, malignant or benign, organic or spastic, will cause this alternating peristalsis and antiperistalsis with distinctly increased antiperistalsis in a degree varying with the severity of the obstruction.

Wolf declares that carcinoma is the most frequent malignant affection of the colon. Although a carcinomatous process may ensue in any part of the colon, there are certain locations of predilection. Carcinoma is more apt to occur in colonic segments which are exposed to insults from passing or stagnating intestinal contents. Such locations of predilection of the cecum, in which the intestinal

contents may remain twenty-four hours, the hepatic and splenic flexures of the colon, the sigmoid flexure through which the feces pass after they have attained considerable consistency, and the rectum. The most frequent carcinomata are those of the rectum, then follow those of cecum and sigmoid flexure; next in frequency are those of the hepatic and splenic flexures; ascending, transverse and descending colon are affected in rare instances. Changes in the general condition of the patient, although the slowly developing colonic carcinoma causes loss of weight, weakness and disturbances of appetite relatively late in the course of the affection, should draw attention to the existence of a malignant neoplasm. The most characteristic symptoms of the affection are the palpable tumor, manifestations of intestinal stenosis, and secretory anomalies. It is at times very difficult and even impossible to determine whether an existing stenosis is a genuine benign or a malignant one, or but a functional contraction. There are cases of intestinal spasm on a neurotic basis which cannot be recognized as such without an exploratory laparotomy.

Tupper writes that malignant disease of the appendix is not uncommon. The new growth cannot be clearly differentiated from carcinoma microscopically, but clinically its deportment is definitely that of the endotheliomata elsewhere in the body. The malignant process is probably grafted on the appendix that has, as the result of inflammatory action, undergone cicatrization and partial or complete obliteration of its lumen. The removal of the involved appendix generally compasses the trouble, as secondary glandular involvement and metastases are rare. In rare instances the cecum seems to have been involved secondarily to and as the result of the cancer of the appendix, but definite proof of this is wanting.

## DIAGNOSTIC AND THERAPEUTIC NOTES.

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**POWDERED MERCURY.**—Unna (*Derm. Wochenschr.*, 1915, No. 14). In the manufacture of mercurial ointment, the extinction of the metallic mercury is a matter of some labor. If it is not adequately done, the resulting ointment is unsatisfactory. Unna has found that this process is greatly facilitated by the use of activated oxygen. As a carrier he uses lycopodium rubbed up with old oil of turpentine. As soon as mercury comes into contact with this mixture, a dry yellowish-gray powder results, in which the mercury is very finely divided. A little trituration produces a powder, in which no mercury droplets are visible under the microscope.

The toilsome preparation of ung. hydrargyri is thus rendered superfluous. The powder may be rubbed up with fat, to make an ointment, or better still it may be rubbed directly into the skin by means of a cotton ball. Much rubbing does not appear necessary. The powder may also be dusted over chancres, ulcerated gummata or syphilides. It is very effective in pediculosis.

**ILEUS DUPLEX.**—Handley (*Lancet*, May 1st, 1915). Sometimes, as a result of pelvic peritonitis, intestinal obstruction occurs simultaneously at two points, where the large and the small gut, respectively, dip down into the pelvis. These are the ileum, at a point about 3 ft. above the ileocecal valve and sigmoid at the junction of its iliac and pelvic portions. A recognition of the dual nature of this form of ileus goes a long way toward the reduction of its mortality. Handley cites his results in the operative treatment of cases of this type before he appreciated the duality of the lesion. In this group, in which ileocecostomy alone was performed, 4 of the 6 patients died. After the recognition of the nature of the lesions he performed ileocolostomy combined with cecostomy and had three recoveries and no deaths.

**THE PATELLAR REFLEX.**—Gerson (*Therap. der Gegenw.*, 1915, No. 3). In cases in which it is difficult to elicit the knee-jerk, the physician's arm may be slipped under the patient's thigh, the hand clasping the anterior aspect of the other thigh. The leg to be tested then swings freely over the operator's arm, and the reflex, if present, is readily elicited.

**THE TREATMENT OF ACUTE CORYZA.**—Rosenthal (*Deutsch. med. Wochenschr.*, 1915, No. 13). The writer states that surprisingly good results are obtained in acute coryza from the administration of dionin, in half grain doses, once or twice daily. The dionin is best prescribed as a powder, mixed with sugar. The secretion dries up, the sneezing ceases, the general malaise disappears. Later, salicylates should be given to complete the cure.



THE CARAMEL CURE IN DIABETES.—Umber (*Deutsch. med. Wochenschr.*, 1915, No. 7); Klemperer (*Therap. der Gegenw.*, 1915, No. 3). In an article, abstracted in these columns last year, Grafe pointed out that caramel is a suitable and useful article of diet for diabetics. Both Umber and Klemperer now endorse these findings. It may be given in considerable quantities without increasing the excretion of sugar and is a valuable nutritive element. In advanced cases, it may even replace the oatmeal cure, either alone or together with vegetables, fat and eggs. Unfortunately it must be accurately prepared, which limits its usefulness in all but the most intelligent households. To produce it, cane sugar is heated in an aluminum pan for thirty to forty-five minutes. The temperature must be at least 200° C., or the sugar will not be converted, but not over 220° C., or toxic products arise. A suitable caramel may be bought under the trade name of Caramose (Merck). A variety of caramel recipes are given, for which the reader must be referred to the original articles.

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TUBERCLE BACILLI IN STOMACH CONTENTS.—Levy and Kantor (*Arch. of Diagn.*, 1915, No. 2). The writers have been able to demonstrate tubercle bacilli in the stomach contents of three patients suffering from pulmonary tuberculosis. They believe that where, as in their cases, expectorated sputum is unavailable, a certain number of positive diagnoses of pulmonary tuberculosis can be made with the aid of the stomach tube. The technique is the same as in the examination of sputum. It appears that the gastric secretion does not affect the staining properties of the tubercle bacillus.

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PROGNOSTIC SIGNIFICANCE OF TUBERCULOUS CAVITIES.—Fishberg (*New York Med. Jour.*, June 26th, 1915). The significance of tuberculous excavations of the lungs is estimated by the consideration of two factors: The acuteness of the underlying process, and the time it took for the production of the cavity.

In very acute forms of tuberculosis cavitation is exceedingly rare. The prognosis is gloomy with or without localized destruction of pulmonary tissue. In adults such cases are rare, but in infants rapid cavity formation is seen at times and the termination is almost invariably fatal.

In subacute forms of phthisis, in which excavations are apt to form very rapidly, the prognosis is unfavorable, unless the cavity is rather small. In the latter case the disease may be attenuated and subsequently pursue a chronic course with the sequestration and expulsion of the affected area. Excavation is then the first step toward a diminution of the acuteness of the tuberculous process in the lung. The general symptoms may be ameliorated, as after the evacuation of an abscess.

In chronic phthisis, excavations, even when extensive, are compatible with a long and efficient life. These cavities are surrounded by a more or less dense fibrous capsule which limits their extension and are drained through a fistulous tract communicating with a bronchus. As long as the secretions are eliminated by expectoration, the patient may feel quite comfortable for years. Because

they expectorate large numbers of tubercle bacilli, they are often sources of infection to a greater extent than many patients without excavations.

Pulmonary cavities may heal. When small, they may be obliterated by granulations or by calcification of their contents. Larger excavations may shrink, or, even when remaining of large dimensions, they may become altogether benign after the necrotic tissue has been expelled. They are, however, a constant source of danger for metastatic autoinfection.

On the whole, cavities are an indication of chronicity of the tuberculous process in the lung, showing that the resisting forces are active and as such are less dangerous than many cases which have by common consent been considered incipient and curable.

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INTERCOSTAL THORACOTOMY IN EMPYEMA.—Lilienthal (*New York Med. Jour.*, January 30th, 1915). With the patient under nitrous oxide and oxygen anesthesia, a long intercostal incision is made, beginning at a point just outside the costal angle and continuing for the length of the bony rib. The incision throughout its entire length should enter the pleural cavity. With blunt retractors the ribs are now separated until the blades of a rib spreader can be inserted. When wide retraction has been accomplished and the chest emptied of fluid, systematic inspection of the lung should be made with a view to determine, if possible, the site and character of the focus of infection. A minute point of gangrene, a small bronchiectatic abscess, a sign of traumatism perhaps inflicted by the aspirating needle, or the presence of a broken-down tumor should be dealt with as occasion seems to demand. The entire hand being introduced into the adult thoracic cavity, adhesions may be broken down and lymph coagula removed. With the retraction in the adult of, say, from 4 to 7 in., perfect visual exploration is now possible. In children the opening, though smaller, will be found ample for exact manipulation. When satisfactory expansion has been secured and the intrathoracic work has been finished, the rib spreader may be removed and the chest permitted to assume its normal shape. It will be found that the ribs come together nicely, but that on account of the division of such a large part of the intercostal muscles the bones are not as firmly drawn together as when the incision is shorter. Two or three short drainage tubes, carefully secured so that they cannot slip within the chest, are now put in, and it will be found that they are not obstructed by rib pressure. A few interrupted sutures through the skin will close the long wound sufficiently, one or two additional sutures helping to approximate the divided latissimus dorsi. A thick dry dressing is now applied and the patient sent back to bed. Breathing exercises and especially blowing exercises are to be commenced almost immediately. If one is dealing with a simple pneumococcus case uncomplicated by unresolved pneumonia, one may hope for a complete closure of the wound in two weeks. At no time should irrigation be practised. In the complicated cases and especially in the complicated cases and especially in the metastatic empyemas, revision may be required. If so, it is merely necessary to reopen the wound and again separate the ribs with the spreader far enough to permit exploration of the suppurating cavity.



## BOOK REVIEWS.

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THE RESPIRATORY FUNCTION OF THE BLOOD. By Joseph Barcroft, M. A., B. Sc., F. R. S., Fellow of King's College, Cambridge. New York: G. P. Putnam's Sons. 1914. Price, \$5.75.

For some years, the entire question of oxygen supply to the tissues has been in a state of flux. The old theory of mechanical diffusion, according to which the oxygen in the pulmonary alveoli diffused into the blood through the alveolar lining, as through a dead membrane, and from the blood into the tissues in similar fashion, has been giving place to a more complex but more rational secretory hypothesis. The diffusion theory implies that the oxygen pressure in the alveoli is higher than that of the pulmonary blood, and that of the circulating blood higher than that of the tissues. This may be true at low levels, where the oxygen pressure of the air is high, and with the organism at rest, when the demand for oxygen is low. But what is the situation at high altitudes and during exercise? For the purpose of investigating this and similar problems, the author carried out an extensive system of experiments both in England and at high altitudes in the Alps and on Teneriffe. His data strongly confirm the secretion hypothesis. The pulmonary epithelium apparently has the power of extracting oxygen from the alveolar air, so that the oxygen in the blood may be at a greater pressure than that in the air from which it is derived. The same principle doubtless holds in the transfer of oxygen from the blood to the tissues.

The reader who carefully peruses the book from cover to cover will be well rewarded. Some consideration might however have been shown for those whose limited time prevents them from giving it such careful study. Nowhere is there any summary of the conclusions derived from the experiments, and the index at the back is woefully incomplete.

COLLECTED PAPERS OF THE MAYO CLINIC, Rochester, Minnesota. Edited by Mrs. M. H. Mellish. Volume VI, 1914. Philadelphia: W. B. Saunders Company. 1915. Price, \$5.50.

This sixth volume of the collected papers from the Mayo clinic makes the usual strong appeal and also, as usual, defies detailed critique. In all, there are thirty-one contributors, and sixty odd contributions. In the short space of a book review it would be impossible to indulge in any type of detailed comment and at the same time avoid the pitfall of invidious comparison. The important consideration is this—namely, that one of the most active surgical clinics in this country utilizes to the *nth* degree every clinical and laboratory facility for the purpose of disseminating medical knowledge. Surely if there is any plan or policy which entitles a group of medical workers to claim their "Place in the Sun" it is the combination of the treatment of disease and the study of disease as mirrored in these volumes from the Mayo clinic.

AN INTRODUCTION TO THE STUDY OF COLOUR VISION. By J. Herbert Parsons, D.Sc., F. R. C. S., Ophthalmic Surgeon, University College Hospital, etc. etc. New York: G. P. Putnam's Sons. 1915. Price, \$3.75.

This is a very complete treatise on the intricate subject of color vision, written by one who has thoroughly mastered the great mass of theories and facts which have been gathered about this subject. The author, as he states in his introductory chapter, approaches this problem unbiased as far as any particular theory is concerned, and his first task is therefore to set before the reader a résumé of the various theories of color perception, most of which have been advanced by physicists.

There are two chapters on the anatomical and physiological basis of color vision, which give clearly the various accepted facts concerned in the production and interpretation of color stimuli. These are succeeded by chapters on the physics of color, which contain all the well-known conceptions of color



as a physical phenomenon. For the general reader these chapters are rather difficult to follow as they deal largely in mathematics and graphic conceptions. The evolution of color vision is a fascinating chapter written in a broader spirit as the subject naturally permits. The researches of Rivers on color perception among primitive people are given the prominent place they deserve.

Part II deals with the pathological aspect of the question, color blindness and other variations from the normal. The last chapters turn again to a more theoretical view, being a consideration of various researches based upon the theories of the three great authorities on color vision: Young, von Helmholtz, and Clerk-Maxwell. These are technical chapters which can be followed only by those whose training in physics enable them to follow the intricate formulæ and diagrams.

This book is a very complete and well-written treatise on color vision done by one to whom no phase of the subject appears foreign. The style is clear, precise and with no padding. The bibliography indicates extensive reading. To the ophthalmologist such a book is invaluable and to the general medical reader and the neurologist it is essential to the understanding of color perception and its frequent anomalies.

**THE NERVOUS SYSTEM AND ITS CONSERVATION.** By Percy Goldthwait Stiles, Instructor in Physiology in Harvard University, etc. etc. Illustrated. Philadelphia: W. B. Saunders Company. 1914. Price, \$1.25.

This is one of the best of the small books on the physiology of the nervous system, written by one who possesses the invaluable gift of writing easily and clearly about an intricate subject and in such a way that almost anyone of intelligence will be interested and entertained. The reviewer, it must be confessed, approached this book of Stiles a little sceptically, remembering his disappointment on reading other books of this nature the plan of which was to put into simple form so complex a subject as nerve physiology. Much to his surprise he found this delightful reading and full of unexpected, original ways of stating well-known things. It is remarkable how much information Stiles has managed to compress in the comparatively few pages of this book. It will be found that there is little of prime importance in the realm of the physiology of the nervous system that is not touched upon here, however light that touch may sometimes appear to be. The neuro-muscular mechanism is especially well handled. The chapter on emotion forms pleasant reading also. The final chapters are devoted to the hygienic aspect of the question, such topics as sleep, dreams, fatigue, etc.

A great deal of praise must be given to Stiles for this book because the difficulty of planning and writing about the nervous system for the general reader must be very great. Stiles has managed to accomplish this task with a certain ease and grace combined with accuracy and a just sense of proportion which makes of his book a rare literary performance.

**THE DUCTLESS GLANDULAR DISEASES.** By Wilhelm Falta, of Vienna. Translated and Edited by Milton K. Meyers, M. D., Neurologist to the Lebanon Hospital and to the Dispensaries of the Jewish and St. Agnes Hospitals, Philadelphia, etc. etc. With a Foreword by Archibald E. Garrod, M. D. (Oxon.), F. R. C. P. (London), F. R. S., Physician to St. Bartholomew's Hospital, London. With 101 Illustrations in the text. Philadelphia: P. Blakiston's Son and Co. Price, \$7.00.

A translation into English of Falta's monumental work on diseases of the endocrine glands will be welcomed by the medical profession. Nowhere else will be found such accurate and detailed description of the symptom groups which have their origin in lesions of the glands of internal secretion. It is all the more valuable because it is the work of a physician who combines bedside observation with experimental research in the laboratory, and who has been led to the study of the regulations of metabolism by his interest in the chemical processes which it is their function to control.

It is all the more to be deplored that the translation itself is so faulty. The attempt to reproduce the exact shade of the author's meaning is no doubt praiseworthy, but it should not lead to the neglect of idiomatic English. The tendency to Germanisms and to involved sentences makes the English text very hard reading, and sentences like, "Also after castration in women is the sexual sense reduced," are far too common. On the other hand, incorrect spelling of German words is not rare. It is a pity that such faults should mar what is really an invaluable book.

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## EDITORIAL.

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### THE IDEAS OF YESTERDAY.

In the medical world just as in all the other worlds, be they literary, political or military, a seething process is continually in evidence, an upheaval so to speak of small or vast proportions, caused by the obtrusive insistence of new ideas and the stubborn resistance of old ideas in the matter of just what should constitute the trend of thought to insure the greatest benefits to those who are about to become the torch-bearers for the rest of mankind. In our medical schools of the better sort, and by 'better' we mean those that have been caught and held fast in the fangs of science, any old-fashioned idea, be it ever so demure, that has slipped through the "corridors of Time" and begs to nestle among the boisterous and arrogant scientific ideas of to-day, is soon put to flight or crushed under the iron heel of the vigilant warders whose one thought is to exclude everything that smacks even in the slightest degree of a bygone generation. This attitude indicates a progressive spirit without doubt, and has much to commend it. But it is not always an attitude that is flawless; it is not always a front that is impregnable. That the warders at the gates of our medical schools are in their intellectuality striving towards great heights is true, but it is also true that they overlook the fact that not every student is going to be or can be, for that matter, a 'scientific' doctor. He may have in his makeup some good qualities as a human, and some poor qualities as a scientist. But just because his nostrils do not dilate every time a professor wishes him to scent something 'scientific' in his didactic or clinical lecture is no reason for saying that later on, when he is a practitioner, he will be unsuccessful. All of us have heard of the bright boys at school who have been greatly admired by their teachers and envied by their co-pupils, because they knew their history and literature lessons, who afterwards were unsuccessful because they were too weak, too ill-prepared to withstand the buffets

in the battle of life. There are so many illustrations of this that the fact cannot be gainsaid, and what the true explanation is, if what we have just written is incorrect, we leave to the reader. And in the case of the medical student, a like situation obtains when undergoing his tutelage: the 'scientific' student, due to the 'scientific' professor's enthusiasm, is thrust continually into the limelight. That he deserves encomiums goes without saying, but are they going to help him in the way he hopes—that is in a material sense when he is a practitioner? Has not the human side of his nature been battered and almost destroyed up to the point that means forgetfulness of what the lay world really demands in the sickroom? Will he listen with enough amiability to the complaints of a garrulous mother, whose solicitude for her child is unnecessary, so that she will sing his praises as 'a real kindly doctor who feels for his patient,' or will he hark back to his medical school-days and console himself with what the 'scientific' professor once said of him, and treat the mother's talkativeness in a supercilious manner? Will he be the ideal doctor that even the educated in the lay world demand, or will he be the medical ascetic whose mind is so wrapped up in the scientific trend of medicine that the sick-bed has to him only the characteristics of the laboratory table? And finally would he aspire to treat Mr. Filson Young, the English essayist, from whose recent book\* we are quoting the following essay, "On Calling in the Doctor"?

"One of the most sobering events of middle age is the first realisation that one's health is a thing that must be taken care of, and that one's body will resist undue demands upon it. Hitherto we have been busy with other things, and in the glorious crowded morning-time of life have had little time or necessity for preoccupations as to the maintenance of physical health. We took it as a right and a matter of course, like the air we breathe and the water we drink. But afterwards, in that trying time when a man must realise that his youth is gone, that the season of hope and promise is over, and that from now to the end it must be either performance or remembrance, it comes upon him with sometimes painful realisation that attached to, mysteriously involved with, his eager and still aspiring spirit, is a creature of flesh, which shows signs of rebellion, and even—oh horror!—of decay. With something like shame and humiliation he realises that this physical machinery is of immense importance in hindering or furthering his prime activities. Memories of that happy period when the flesh was no burden assail him; he becomes increasingly conscious that he has a vile body, and wistfully dreams of a glorious body.

"It is then that, with something like desperation, we begin to cast about us in the search for some remedy for disease, or some conserving elixir of life. Youth and health themselves have little preoccupation with such matters; it is middle age and the age that follows it, and broken health and the symptoms of disease which set man forth on the quest of the glorious body, or of some one who will help him to attain to it.

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\*New Leaves. London: Martin Secker. 1915.



"I may say at once that I have never yet found the ideal doctor. My indispositions are few and simple, and of a kind for which conscience rather than science indicates the treatment; so my opportunities of choice have been few. And one's choice is rather more limited than appears. I live in a part of Mayfair which is much inhabited by doctors; their plates gleam upon every hand as I walk to my own door. I feel that I would like to try them all, but an inherent sense of loyalty keeps me faithful to one, especially as when he was first called in he had the tact carefully to inquire into my habits, and to explain that none of the things I enjoyed most was bad for me, provided, etc. But sometimes unworthy doubts assail me. I wonder whether, by employing some other doctor, I might not enjoy buoyant health without any moderation at all. And then I look at the brass plates as a child with a shilling to spend looks in at various shop windows, and wonder, supposing I were to make a change, in which quarter my money would be best expended. The mere brass plate or condition of the hall door no longer deceives me. I have seen the shabbiness behind too many smart hall doors to take them as an indication of anything at all except a desire to keep up appearances. Window curtains and the condition of the windows themselves are a much better guide; but all these externals are really fallacious; and there is no safe guide to the choice of a doctor except by actual trial. Even that is apt to be disappointing, as in the case of Carlyle, who thus describes the attempt to deal with one of his hygienic crises: 'I had ridden to Edinburgh, there to consult a doctor, having at least reduced my complexities to a single question: Is this disease curable by medicine, or is it chronic, incurable except by regimen, if even so? This question I earnestly put; got response, It is all tobacco, Sir; give up tobacco. Gave it instantly and strictly up. Found after long months that I might as well have ridden sixty miles in the opposite direction, and poured my sorrows into the long, hairy ear of the first jackass I came upon, as into this select medical man's, whose name I will not mention.'

"And even when we do try a new doctor, how many of us want the same thing from him? If we are really ill of course we want to be made well; but the majority of a doctor's work is attendance on people who are not really very ill at all and to whom his visits are a luxury. I confess that I like extremely to be visited by the doctor. I cherish the thought that a man who has spent years in the arduous and difficult pursuit of exact scientific knowledge is concentrating the whole of his resourceful experience upon me. I feel sure that he cannot fail to be struck by the peculiarity and exceptional interest of my case; and here I may point out that the first duty of a desirable doctor is to appear to be so struck and impressed. If he does not, the awful thought seizes me that familiarity with disease has made him contemptuous of it and that his perceptions are dulled by custom. He may be blind to the vital significance of my symptoms. Nothing therefore that he can do can restore him to my confidence. If I get worse it is through his blunder; if I get well it is owing to the inherent nobility of my constitution. And in either case I inevitably regard him as a man who may be very well for ordinary, everyday people, but who is unworthy to attend upon me.

"Then there is the doctor who takes you too seriously, and he is the most undesirable of all. He forbids you this and that, and tells

you that you must not smoke at all for three weeks, and also gives you other commands which, as he ought to know, any child would disobey. You do not choose him a second time. Perhaps the most alluring type of doctor is he who flatters you by assuming that you have a scientific knowledge almost equal to his own, and who discusses your symptoms, not in insulting language which you can understand, but in terms which he would employ if he were consulting with a fellow practitioner. He takes you into his confidence as it were. He says, 'I am not going to give you medicine because you are quite sensible enough not to believe in it. I have found that a little dry champagne in these cases works wonders; but there is one thing you must on no account touch, and that is sherry.' Here he draws a bow, pretty safely, at a venture, hoping that you detest sherry. If, on the other hand, it should have proved to be a really bad shot, and that you really are fond of sherry, he will say, 'Very well, then, a glass or two of dry sherry; but, remember, no champagne!' The two tastes hardly ever go together. The ideal doctor will proceed on a system of this kind, but he will, in addition, cure you. That is essential. What one asks from a doctor is, in short, that he will employ the particular kind of manner and method which is most attractive to you, and that he will, in addition, get rid of your ailment. It is asking a good deal, I admit, but one does ask a good deal from doctors; and, to do them justice, one generally gets it.

"There is no doubt that the old type of family physician had this great advantage over men of the more modern school—that he did acquire the knack of approaching every case with a gravity and seriousness, or appearance of gravity and seriousness, which were very reassuring to the patient. Something of the mystic, or at any rate some sense that there is a mystery in the healer's art, was part of the equipment of the old physician. The modern attempt to treat the practice of medicine as an exact science has not been entirely successful. The truth is that healing is an art, and not a science. It is an art of which science is the handmaid, not a science with a little art thrown in. And when this is understood, all the gravity, all the mystery, and all the ritual that accompanied the old 'bedside manner' have a certain use and propriety. How wonderful is the sensation of confidence and hope which a really impressive manner, backed by a sound knowledge and experience, can inspire in a sick person! You may say that it is the knowledge and experience that effect the cure, and not the manner; and yet we have all known cases in which the most undeniable attainments, being allied with an awkward, diffident, or unsympathetic manner, have failed to inspire just that degree of confidence that will induce a patient to make the little effort that may be vital to recovery. We all have our superstitions; in the slums it is the exhibition of some black and nauseous draught which inspires the patient with confidence in his doctor's ability; in my case, the draught must be of a little more subtle and delicate kind, and be administered *per aurem* instead of by the mouth; but the difference is only the difference of composition; the draught or the cachet, the bolus or the linctus, must still be administered. I see that the Government are to make the doctors a certain allowance for the drugs they use; but I fear they will make no allowance for, and so probably discourage, the use of those more subtle, intellectual applications which give such variety and such pleasure to the experience of being mildly out of sorts." P. S.



## LITERARY NOTES.

To describe the principal figures in the present European war is the habit of the day, and while some of them get only a short notice in the newspapers, others are honored with essays in our leading magazines. The most complex figure, the Emperor of Germany, fares much better at the hands of writers than do any of the Generals in the field, be they on one side or the other, for though he is not in active service, his personality is so far from simple that a book of some length is necessary to explain its salient points. When we wrote the word 'better' we really meant that the Emperor was being studied on a larger scale than are the others and not by any means that the attitude of the writers is completely sympathetic. This thought must occur to all who have read Dr. Morton Prince's "The Psychology of the Kaiser" (Richard G. Badger, Boston) and Dr. Augustin Cabanès' "Folie d'empereur" (Albin Michel, Paris), since both authors are quite convinced that their hero (?) is abnormal enough to enlist their closest attention and drive their pens into those neurological complications of thought which are a snarl to all readers who have from experience and observation superficially divided the men folk of the world, be they in books or in real life, into two distinct classes—the good and the bad. But in saying this we do not wish to convey to the reader the idea that the books under consideration are not understandable, but rather that they are written to prove the writers' theories; and to do this there is much delving into the subconscious mind in Dr. Prince's book and an extraordinary amount into the past history of the Hohenzollerns in the French work, which is written with great care and much historical knowledge and with a fullness that requires 460 pages in the telling. The conclusions both authors reach are not any too complimentary, though it must be said that the American author's opinion is kindness itself alongside what the Frenchman says. Surely it denotes a mild and gentle art to sum up the matter as does Dr. Prince when he says, "The Kaiser's real obsession is a subconscious phobia, a fear of democracy for himself and his House." But can the same be said of Dr. Cabanès when he says, "Guillaume II réunit tous les attributs de ses ascendants: la brutalité du Roi-Sergent, l'amoralité du 'grand' Frédéric, le piétisme exalté de Frédéric-Guillaume II, le cerveau fumeux de Frédéric-Guillaume IV. Celui-là est fatalement voué à l'irréremédiable déchéance, qui résume en lui toutes les tares ancestrales" (William II has all the attributes of his ancestors: the brutality of the King-Sergeant, the moral imbecility of Frederick the Great, the exalted pietism of Frederick William II, the choleric brain of Frederick William IV. These characteristics are unmistakably those of an incurable decadence, and in him [William II] are summarized all the ancestral defects) ?



Owen Wister as a novelist is not the artist in words one would wish him to be, but Owen Wister as an essayist leaves little to be desired, if we are to judge him by his two recent excursions into the province of 'dispersed meditations.' Some months ago his entertaining and instructive onslaught on the American quack novel startled us from our apathy and indifference as to what constituted a meritorious work of fiction and made us aware that the latest novel, no matter how poorly written, if heralded as the 'best seller,' was read by the American public with the sort of indiscrimination that should characterize the unfledged. To-day we have before us the second exposition of his thoughts, and again he shows that his cunning is of a high order. That the novelist has found himself after years of what he thought was his chosen field should be a matter of congratulation; and if he continues the good work he has done in "The Pentecost of Calamity" (The Macmillan Company, New York), the American public owes him a debt, indeed. In this book we have a new reading of the Germany of the present day, one that is unique in so far as it has never been expressed before. It is wholly removed from any weakness for the glamor of militarism, but at the same time it is informed with a manliness that has the courage to say what it thinks in a straightforward way. And this the essayist does, and so well that the whole performance is convincing. Of course, exception will be taken to this book by all those who cannot differentiate between German influences and Prussian influences, but no criticism can possibly be made by those who, as Owen Wister, are still in the thrall of Luther, of Goethe, of Beethoven. Nor can one criticize his attitude in the last chapter in which he states certain disagreeable truths about the United States, for he is the sort of American who is still guided by the high ideals of Washington and Lincoln and has little patience with that phase of modern thought that breathes only selfishness and self-aggrandizement.

P. S.

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#### ERRATUM.

On page 948 of the September issue of the JOURNAL (Diagnosis of Diseases of the Colon, Collective Abstract by Dr. Wm. Engelbach) a misprint occurred in the fortieth line to the effect that "Cole maintains that the majority of cases of ileal stasis do not at operation show," etc. etc. This should have read: "Case maintains that the majority of cases of ileal stasis do not at operation show," etc. etc.

## ORIGINAL ARTICLES.

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### A STUDY OF CERTAIN ASPECTS OF EPILEPSY COMPARED WITH THE EMOTIONAL LIFE AND IMPULSIVE MOVEMENTS OF THE INFANT.

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By L. PIERCE CLARK, M. D., of New York.

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In previous studies of the epileptic constitution\* and in a psychologic study of the meaning of the fit in epilepsy,\*\* it was shown that the fit was a libidinous outlet for the infantile unconscious. The loss of consciousness was shown to be due to the insistent demand for expression of the unconscious, transferring the older conception from a negative postulate to a positive dynamic one. In its simplest and crudest form the nucleus of the unconscious striving was a desire on the part of the individual epileptic not only to return to a state of infancy with the parent, but it really contained a motive for the epileptic to gain the life before birth as symbolized in the idea of life within the mother. In a measure this hypothesis supported by clinical observations seemed to be a sufficient psychologic explanation of the fit so far as loss of consciousness was concerned, which is, after all, the real nucleus of the epileptic attack.

But still other questions arise for solution, one of the more immediate being an interpretation of the convulsive movements of the seizure. We are naturally led to examine the extra- and intra-uterine life of the child for the physical correlates of the convulsive spasm in the fit. We find on doing so that there is a very close parallel of movements at that period which, when under certain states of excitation, produce acts that are identical, point for point, to those seen in grand mal epilepsy. Before detailing their points of identity I would call attention to the fact that probably all the convulsive movements in the various types of epileptic fits, from the most purposeful and apparently ideational or voluntary acts seen in the slightest grades of seizures, are drawn from the different developmental levels of child activities.

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\*Clark: A Personality Study of the Epileptic Constitution. (*Amer. Jour. Med. Sci.*, November, 1914.)

\*\*Clark: The Nature and Pathogenesis of Epilepsy. (*New York Med. Jour.*, February, 1915.)

They start from the first spontaneous or impulsive movements of the intra-uterine life, which correspond to the tonic-clonic spasm of the grand mal fit, and shade out or up in development through the taking on of the reflex, the instinctive, and the ideational movements. Such movements form the different types of the slighter or milder seizures of partial epilepsy, and even the para-epileptoid symptoms of the epileptic psychoses. All these different developmental levels of fits may be disturbed at the same time in the one fit, or, they may occur at the one period in any single fit, making the convulsive seizure seem like a monstrous blending of different types of child movements. This blurring or overlapping of all sorts of movements has accounted in no small degree for the bewilderment experienced in our trying to describe an atypical seizure wherein different types of acts are transpiring simultaneously in different degrees. Studies with this view in mind ought to show the successive order in which the neuromuscular or psychic mechanism is assaulted, and to what psychic and physical depth the discharging fit really penetrates. From such data it may be possible for us to form a clearer diagnosis and prognosis of the individual case. However, one must not forget that the real causative agent in all fits is the same, whether they are of the mildest petit mal type, or the severest grand mal. That is, the infantile unconscious really demands expression by a discharge of its displeasure affects and at the same time seeks a flight from these harassments to a state of harmony and peace, the only one it has ever known—that of intrometro-eroticism; the kind and character of muscular movements the unconscious sets in motion to gain this end marks the intensity of the organic demand in the particular case. Any number of precipitating causes may fire the fit-gun, but nothing but a profound defect in the organic life can make the epileptic constitution and the sequential seizure phenomena.

To limit the field of argument and discussion at this time I shall consider only one type of epileptic convulsion, the grand mal, with its cry and tonic-clonic spasm.

While we have minute and accurate descriptions of the convulsions of epilepsy, we have not very recent or painstaking analyses of the nursling's movements. We are obliged to depend upon the now somewhat old, yet extremely careful descriptions of Preyer, who summarized the whole subject and added his own painstaking observations. As is well known, the whole behavior of the nursling is determined insensibly by feelings of pleasure and those of discomfort; the latter, of course, far outweigh the former and diminish in the normal child very rapidly after the first few months. The intensive longing of the child, or the unconscious demand of the supersensitive epileptic to return to its former state of warmth



and protection where even the instinctive demands of hunger and fatigue are not felt, must be very great. The soft protection of the covering blankets, the free medium of permitted activity in the warm bath, must intensify the infant's longing to continue those states or return to the one analogous to it, from which it was so ruthlessly expelled at birth. The hampering and unpleasant influence of the clothing, forcing as it does stereotyped positions, must be alike unpleasant to the child and to the epileptic. The latter in particular shows his desire to free the person of clothing in the unconscious and automatic phases of his disease. The attempt to disrobe in the post-convulsive state of epilepsy is common. The desire for riddance of clothing is so much a part of our instinctive life that the ages have not greatly reconciled even so-called normal individuals to social life with its dress hindrances. Efforts to restrain the epileptic from disrobing while in the automatic state of the fit often entail antisocial reactions wherein the greatest violence is shown; therefore the relief from disagreeable conditions and the abreactions from them play the greatest motivation in the acts of the epileptic in the fit. The same principle undoubtedly causes the instinctive urge in the automatic state in which the epileptic often wanders from home or his usual abode. The motive of the *wanderlust* and many another infantile behavior in the neurotic may have a similar interpretation.

The epileptic cry has long defied analysis; to some it spells despair, to others it is not unlike the lowing of cattle, to still others it possesses an indescribable mingling of joy, surprise, and hate. What is the epileptic cry if not a part of the piercing, persistent, high-pitched tone of pain, the whimpering plaintive note of the uncomfortable posture, the loud, blatant, noisy cry of the infant, —suddenly rising to unexpected intensity when placed in the cold bath? The often meaningless, unanalyzable crowing or piercing shrieks, given an expression through the adult vocalization, are none other than discharges of accumulated motor impulses. The correlated spasms in the laryngeal and respiratory apparatus but heighten the explosive unconscious impulsions of the infant in an adult setting. One may not consciously mimic the epileptic cry any more than any other part of the real convulsive fit. In the after-state of the fit as consciousness returns one often notes the addition of the moan and groan of the adult, which is quite foreign to infantile life. The moaning and groaning seem quite in the realm of the conscious, but not so the initial epileptic cry; the cry of protest, the corrugated brow and screwed up face in the intenser spasm of a fit find a parallel in the infant's reaction to a strong emotion of displeasure. Such convulsive movements in the adult epileptic as well as the cry are always unconscious and therefore can have only a secondary conscious elaboration in the observer's

mind, who, often enough, strives to make them mean something quite adult in expression. On the contrary, most observers have agreed that the cry must be more than a mere mechanical expulsion of air from the thorax as a sequence to the tonic spasm. We know the nursling often expresses a combined pleasure and displeasure cry starting with a high-pitched crowing tone and ending with an acoustic expression, a peculiar grunting caused by oscillations of the uvula with the mouth shut or a little opened; the latter part of this act is associated with fixation of the abdominal and chest muscles in an expiratory act. Such a combined displeasure-pleasure cry is not very dissimilar to the epileptic cry when one allows for the structural difference of the organs involved in the adult from that of the baby. Almost invariably one finds this peculiar cry in infants associated with tonic-clonic movements in the arms and legs. In point of fact my attention was first called to the whole matter in my interne days at Craig Colony; I then lived in the observation hospital and was making a prolonged study of status epilepticus and its exhaustion palsies. It was also a time when my first child was an infant a few months old. One day on returning from the wards I saw the child's impulsive and random movements, and heard this peculiar displeasure-pleasure cry accompanied by the tonic-clonic movements above mentioned. I was startled by the close resemblance the whole picture had to that of the grand mal attacks of epilepsy I had just witnessed in the ward. I believe the newer psychologic interpretations on the basis of a displeasure-pleasure hypothesis will throw a flood of light on both processes in the infant and in the epileptic attack initiated by this peculiar cry. The child's excessive inclination to simple movements in joy or hate has seemed very mysterious, but its instinctive leap from displeasure-crying to pleasure-laughter is an infantile parallel to the adult displeasure-pleasure motive in the fit. The two are only understandable when the labile psychomotor development of the infantile mind and the infantile unconscious of the epileptic are considered together. In both supersensitive states there are very strong feelings which are brought into play by motor discharges consonant with the character of the stimuli applied. Lest some may be inclined to doubt that the unpleasant feelings are in the ascendancy in the summation of the first half year of life, one needs but to note that even with most careful nursing, ventilation, regulation of temperature of the air and bath, control of the mother's milk, etc., and with the most favorable surroundings, it is not granted to the average child to pass many days without suffering. Then, too, to be as 'sensitive as a babe' is proverbial. Birth itself is painful and the number of children's diseases that are accompanied by severe pain is by no means small. Mortality is not a little accentuated

by these painful diseases. Not in disease alone, but in health under the most favorable circumstances the infant has hunger, thirst, and discomforts in consequence of inconvenient positions in lying, in being held or from application of cold and wet or the presence of ill-smelling air. The very frequency with which the fit is attended by a deflection of the head to one side or the other, often enough described as a turning away movement, finds its counterpart in infantile life in the very common turning aside of the head at the slightest degree of discomfort even before the displeasure-pleasure crying is brought about. The enormous expressive possibilities of movements of the head and their close association with the expressions of the mobile face are sufficient in themselves to explain the many movements involving these parts in the fit. Coupled with the side to side movements of the head in the fit, one usually sees the facial spasm more marked on one side than on the other even in so-called idiopathic grand mal. This, too, is noted in the infant and is often enough an abreaction of displeasure combined with a pursuit movement for the mother's breast, the source of infantile comfort in time of trouble, the pacifier of unrequited love, or a soft anchorage from a buffeting world of reality. In a careful analysis of a great number of epileptic attacks I was surprised at the great number of instances in which the mouth was first drawn to the side and then upward and backward, even in idiopathic epilepsy, as though in unconscious pursuit.

The form of the mouth in the epileptic attack is probably the most delicate index of the mood of the adult as well as in children. Even in the interparoxysmal period the epileptic mouth is quite characteristic and furnishes not a little to the unpleasant setting of the epileptic physiognomy. The mood reaction to the disagreeable is alike depressive to the angle of the mouth in the passive state in epileptics and in the unhappy state of infants. In the grand mal attacks of the greatest severity as shown in some of my own cases which were photographed some years ago, one sees the quadrangular or squarely open mouth. This form of mouth is almost invariably seen in all severe status cases. All observers of infants speak of this form of opening the mouth in extreme states of displeasure. Darwin particularly dwelt upon it as an extreme expression of childish rage. The accumulated affects of displeasure may break out thus of their own accord in the infant, or in the adult epileptic by an attack; the behavior in either one as far as one may judge is not dissimilar; often the epileptic under what would be considered ideal circumstances suddenly blows up a storm and has a periodic fit discharge of his affects which seem to have been storing up for days previous to the outburst. Many times the infant has these storms of temper from sheer weariness or when the nervous tension is so great that sleep is denied it, or



even when it cannot get to sleep until it has had a crying spell. However, displeasure affects usually initiate the temper explosions in the child and fits in the epileptic. It is interesting to note the *tedium vitæ* in the infant and epileptic alike; the lustreless eye, indolent movements, cessation of spontaneous interest, a falling of the countenance or a somewhat paler complexion; in the epileptic these have long been considered as heralds of grand mal attacks. Even in sleep the finer expressions of dislike and hardness on the epileptic countenance are not absent. The rather uniform expression of unhappiness on epileptic faces in a sleeping ward is striking, and never to be forgotten, once seen.

The great importance of a large amount of sleep in the epileptic is comparable with that required by infants. If the epileptic can make no compromise with reality, in consequence weariness and displeasure affects slowly accumulate, and if these are not vicariously discharged or sublimated in athletics, work, etc., sleep with its enforced withdrawal from the world is doubly necessary with him just as it is with the infant. When both are able to learn the life-compromise, the necessity for prolonged sleep becomes less imperative; the dreams are then less active and possess less insistent longings. Often enough interruptions of sleep in infants as well as in epileptics, during the state after attacks, are alike disastrous to well-being or even to good temper. 'He is as ugly as a bear,' is often the nurse's designation of the epileptic's mood when the latter has been disturbed from the completion of the recovering sleep after a grand mal attack. All observers recognize this and urge the let-alone treatment for the epileptic when he has had a fit. Preyer cites many instances in which children suddenly disturbed from sleep have been thrown into a state accompanied by trembling and convulsions. The same effects have been seen even in perfectly healthy children and a lasting depression of spirits has been engendered.

If it be true that the infantile unconscious is the motive instinct which seeks expression in the fit, then one might expect that the type of muscular movements in the epileptic episode would be from that period; in other words, the movements in the fit would embrace the type of infant activities intra- and extra-uterine. The impulsive activities are always incoördinative and in later life are brought under the domain of the will. In point of fact, in studies of psychogenesis, Preyer and others make them and their instinct incitors from the general functions of fetal tissues actually the nucleus or the beginnings of will itself.

The impulsive acts are not directly useful in any conscious sense, and in infant studies, before and since the time of Preyer's, they have defied analysis in origin, manifestation and ultimate purpose to the organism. These movements are irregular as well as in-

coördinate; they are usually symmetrical yet asynchronous like the more elaborate activities in the fit itself. These impulsions seem to answer no purpose. Often enough they are obstructive to the welfare of the child. Infants in their display frequently inflict harm upon themselves; they strike their eyes or face and even inflict scalp wounds by impulsive head movements. Sleeping infants are often distressed or awakened by the impulsive activities. At times their intensity often amounts to a convulsion. Impulsions have none of the characteristics of an ideationally planned act and are no more expressive of an instinctive movement than they are of a reflex response. The long, careful and well-known experiments of Soltmann have proved this. Impulsive movements proceed from the primary demands of organic life and are the summation of its desires, and may be designated as the organic substratum of the infantile unconscious libido. By far the greater number of fetal activities are of this spontaneous character, and rapidly diminish in the infantile period until the ninth month, when they are largely if not wholly to be seen only in the sleep of young children. Probably not a few of the bizarre movements now and then seen in the adult during sleep and particularly in the epileptic, owe their composition to such impulsive demands. Studies of movements and postures assumed by epileptics during sleep, such as those made at Craig Colony, show these impulsive acts in an exquisite manner. The infantile poses and even the ceremonials of sleep of epileptics should be studied even more carefully. The persistence of these impulsions in the behavior and conduct of the waking and sleeping states of epileptics furnishes an illuminating side light upon the somatic and psychic infantilism of the epileptic. One should also remember that infantilism persists longest about and in the functions of sleep in the otherwise supposedly normal individual.

The impulsive fetal movements begin about the twelfth week of gestation, so the brain cannot be involved per se in their genesis, and further, it is known that brainless embryos possess impulsions. There is a short period just before birth in which the amniotic fluid and the uterine wall greatly inhibit a free play of these impulsive movements, but they begin again with renewed activity in the newly born and, as before suggested, are slowly inhibited by voluntary control at the end of the nursing period. We do not know just how the impulsive movements are incited further than we surmise that, being of the first, simplest and ontogenetic type of activities of the developing organism, their incitor is from the motor centers of the lower order. In these latter structures are stored up a certain quantity of potential energy which is transformed into actual energy by the blood and lymph stream. With the general increasing tissue growth and tension engendered

thereby, the energy finally finds its outlet in these random movements of the fetus and infant and in their exaggerated distorted presence in the grand mal convulsions in epileptics.

Space prevents us from outlining more in detail the essential distinguishing characteristics of the impulsive from the instinctive, reflex, and conscious, or ideational movements of the infant; this has been done most carefully by Preyer and later correlated into a recent study by Canestrini. Suffice it to say the newer studies of the meaning of the convulsive part of the epileptic fit makes renewed and careful study of all these impulsive movements of the nursling doubly necessary. It will then be found desirable to note their exact relationship in reference to the psychosexual development and its defects as shown in the infantilism of the epileptic.

To outline our thesis further: As might be expected, the number of the impulsive movements is not great. They may be schematized as those of outstretching and bending the arms and legs in the newly born. The movements are sometimes so quick as to resemble the cloni of a fit (as I mentioned in my own observation). They may be slow, then fast, and finally end in cloni. Even in healthy infants they may be so slow as to resemble the tetanoid spasm of a beginning focal seizure. Preyer speaks of the muscles involved in the impulsive acts as possessing such a slow crawling movement that the acts present a striking resemblance to the extension and flexion of the limbs of animals suddenly waking from their winter sleep. Such animals, like sleeping children, seen even in the first half of the second year, make genuine fetal movements which often look as though they were directed against some invisible resistance. This all suggests many of the striking impressions one gains in observing the convulsions of epileptics. Convulsive motions in the infantile impulsions are, however, not generally so frequent in sleep as slow contractions. The latter are frequently attended by spreading and bending of the fingers which in turn become the rarer toward the end of the second year in all children of sound nervous systems. All these impulsive movements, in the hands especially, are asymmetrical in outline.

What are some of the depressors and incitors of these impulsive movements? Deep, profound and quiet sleep reduces them to the minimum. Satiation by food greatly curtails them. On the other hand a duplication of the intra-uterine state by the use of the warm bath, encourages them. The movements are then usually slow, rather rhythmic and graceful. One may even see in them the beginnings of an expression of pleasure. The face may join in the picture of contentment with slow asymmetric contortions, which semblance has an odd mixture of pleasure with more than a hint of displeasure. The greater part of the impulsions, however, are



purposeless, senseless and asymmetric and are found over the entire body from the first day of birth. Writhing and twisting of the body are also frequent accompaniments to the movements of the face and extremities. Just as the infant sinks into deep sleep these impulsive movements slow down and the body usually comes to a state of rest in the fetal position. The fetal posture in the legs is kept up longer in advancing child life than that of the head and upper extremities. Many writers have called attention that no one could consciously duplicate these acts. Then, too, one is strikingly impressed that the infant and the epileptic alike are little fatigued by these most intense and persistent impulsions which speak strongly for the unconscious motivation in both their activities. Probably in both subjects the fund of reserve energy being so limited in scope is greater than that of the normal adult as ordinarily expressed in his daily activities. Biologically speaking, we know that the essential vital energy of an individual is probably at its maximum at birth.

In conclusion, we are justified in considering that the essential nucleus of the epileptic fit is a libidinous one; that it consists in an infantile unconscious striving of displeasure-pleasure pursuit ending in the final goal of a return to an intra-uterine life, attended by a loss of consciousness and a convulsion; that the convulsion is made up of and flows out of the general libido striving of the fetal and infantile tissues as expressed through the lower spinal centers in inducing simple and crude combinations of impulsive movements; that a study of the degree of development of unconscious infantile strivings in the psychosexual sphere of the libido, the desire for a fetal intra-uterine state of *allmacht*, is paralleled by the kind and character of impulsive movements found in this infantile period of neuromuscular development. Therefore the two main settings in the epileptic fit, unconsciousness and convulsion, are psychical and physical correlates; lastly, that epilepsy in its essential pathogenesis is an error or arrest in this fundamental elaboration or development of the psychosexual libido.

Having schematized the dynamic mechanism of the epileptic fit, we may note that the essential pathogenesis of the disorder as a whole is still to be attacked. Whether the latter rests upon an inheritance of certain psychic traits alone or whether there are certain somatic structural anomalies which do not permit proper psychosexual development into normal adult life, one cannot say. I believe such studies as I have here and elsewhere reported do, however, narrow the gap between such causes and their psychophysical expression in the epilepsy, and finally, such observations must be of greatest aid in classifying the recoverable epileptics from the irrecoverable ones. It also points the way by which we may advance our therapeutics of the disease along the broadest biologic lines of educational and moral treatment.

## RECENT ADDITIONS TO THE CONCEPTION OF A NORMAL DIET.

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For many years it has been recognized that the diet of man must conform to certain standards. It must evidently furnish the same chemical elements of which the body is composed and which it is inevitably discharging in its excretions. Moreover, these elements must be supplied in the form of compounds not too radically unlike those of the tissues to be nourished. A further requirement is that the daily income shall represent an available store of potential energy equal to the current demands for heat-production and muscular work. A liberal supply of water must be provided to offset concomitant losses, and so to preserve from violation the chemical composition of the organism. Some slight supply of mineral compounds must be had for a similar service. Finally, it is obviously important that the food be digestible and that it appeal to the individual appetite.

These facts were entirely familiar to scholars as long ago as the time of Liebig. Furthermore, we have had, for at least a generation, a large body of knowledge regarding the organic food principles. It has been known that the proteins, complex nitrogenous compounds, are especially needed for the growth and renewal of the living tissues, while the carbohydrates and fats have more particularly the function of serving as fuels, producing heat and movement through their oxidation. None of these views is to be called in question, but much that is interesting and suggestive can be added as the result of recent studies. This is eminently true of our appreciation of the nature of different proteins.

At the beginning of the present century it was generally assumed that proteins from various sources—meat, milk, eggs, cereals, legumes, etc.—must be of about equal value in nutrition and hence mutually replaceable in the diet. Partial exceptions were recognized in the case of those proteins containing phosphorus which must have a somewhat distinctive position. In a single case, that of gelatine, it was known that free substitution of this substance for other protein would not meet the nutritional requirement. The gelatine appeared to be deficient in some obscure respect. We have lately learned in what the deficiency of gelatine consists and that there are fairly numerous examples of proteins which fall short of the highest capacity to nourish the organism.

The process of digestion is a process of cleavage. In its course complex molecules are resolved into more simple ones. When starch is converted into sugar the small molecules in the final stage are all alike. When a protein is digested, the corresponding molecules of the latest order are quite varied. They represent the amino-acids, and the list of those identified numbers about twenty. A laborious comparison of the amino-acids set free from different proteins by thorough-going digestion shows that the proteins are markedly individual. Some give rise to a great variety of amino-acids; others to a smaller number. Sometimes one amino-acid and sometimes another is the most abundant among the products.

Now the amino-acids have been called the building-stones of the tissues and it is evident that they must be furnished not only in sufficient quantity but in adequate variety. In fact, increasing the amount of certain ones is of no advantage when it is others which are needed. We have learned that the trouble with gelatine lies in the absence of one or two of these building-stones from the assortment liberated by digestion. Gelatine is not alone in being a defective protein; others have lately been recognized, chiefly obtainable from vegetable sources. Exact information regarding some of these we owe to the remarkable work of Mendel and Osborne at New Haven.

These investigators have shown that proteins fall in three classes. There are some which are individually capable of sustaining life and growth when given with non-nitrogenous and mineral supplies to laboratory animals. Others suffice only to maintain life without supporting growth. When the sole nitrogenous food of an animal is of this kind it may be kept for months at a nearly constant weight when it should normally be making a steady gain. Afterward, with a more suitable diet, it may grow to full size. This possibility of deferred growth is very striking. Considering the longevity of small animals, it may be comparable with an arrest of development up to the age of forty, in the case of man, followed by growth to adult stature. The proteins of the third class do not even maintain the weight; gelatine is placed here.

In these elaborate studies no effort was spared to secure pure, isolated proteins. A natural food is scarcely likely to yield one and only one type. In view of this and of the fact that the poorest ration will include more than one kind of food, there is little danger that we shall fail to receive all the amino-acids necessary for the constructive processes in our tissues. At the same time there are some practical suggestions springing from the modern knowledge of protein molecules. New light is thrown upon the question of the relative merits of animal and vegetable proteins.

It was formerly held that the two must be quite equivalent,



provided only that they were digested with equal success. But we have interesting evidence that this is not so. Vegetable proteins, as a rule, furnish the amino-acids in proportions radically unlike those demonstrable for proteins of animal origin. It follows that when an animal protein is digested, its separated groupings will be peculiarly well-suited for recombination in the nutrition of an animal. Most vegetable proteins will yield a mixture of amino-acids in which certain valuable members are scantily represented. To compensate for this shortcoming the total quantity of the protein supply must be increased, needlessly augmenting the offering of those amino-acids for which there is no demand. That this condition is a tangible one and not a matter of theory has been convincingly shown.

The experiments of Thomas, cited by Lusk in his "Fundamental Basis of Nutrition,"\* are especially significant. He observed in his own case that very unequal quantities of different proteins were required to maintain his nitrogen balance at the lowest possible level of income and outgo. Thirty grams of meat protein a day would suffice to establish equilibrium. Milk and rice were almost as economical nutrients, 31 and 34 gm. respectively of their purified proteins answering the purpose. Protein from potato had to be furnished in larger amount, 38 gm., while that from beans appeared much less suited to the service, 54 gm. being required. Other selected proteins had to be taken in still larger quantities; the maximum being 102 gm. for the protein constituent of Indian corn. It is interesting to find rice-proteins so nearly equivalent to those of meat and milk in view of the dependence of vast populations upon this grain. Perhaps there could be no better choice.

In regard to the non-nitrogenous food principles, there is less that is novel in the current literature. The main facts remain undisputed: that carbohydrates and fats serve nearly the same purposes and are mutually replaceable to a great extent. How one shall be proportioned to the other seems to be largely an individual matter. The study of diabetes has shown that the oxidation of fats does not take place cleanly unless carbohydrate is being oxidized at the same time. This might seem to indicate that the fat in the diet should not be unduly increased at the expense of the carbohydrate. But we have also learned from the facts of diabetes that the body makes a good deal of sugar from the proteins of the food. The supply from this source probably makes it possible for certain people, for example, the Esquimaux, to live almost wholly upon proteins and fats without falling victims to acidosis.

Carbohydrates and fats are usually considered to be related to the operation rather than the growth of organisms. Their use

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\*New Haven: Yale University Press. 1914.

during the period of growth has therefore been assumed to be essentially for maintenance. But the possibility that the non-nitrogenous foods are to some extent utilized for constructive purposes has remained open and has recently received support from an interesting observation. This is to the effect that a diet containing a certain amount of butter-fat is much more productive of growth than is a ration identical in all respects with the first, save that some other fat is supplied. Hence it seems that the fat of milk—nature's food for the young—has a superior power to minister to tissue-building, though measured by its fuel value it does not rank above other assimilable fats.

Older books on dietetics refer somewhat casually to the rôle of the minor substances or extractives of the food. Under this head have been placed various nitrogenous compounds not excessively complex in structure and not found as ordinary digestive products of proteins. They have been believed to have a certain value through their influence on flavor, their action as secretagogues, and possibly through some regulating effect upon the nervous system. There is now good reason to believe that some of these compounds are of really vital importance. Failure to secure them may be the cause of grave or even fatal nutritional disturbances.

The reference is to the so-called 'deficiency diseases,' of which beri-beri is the best-known example. This is a multiple neuritis with rapid loss of weight and strength. The great majority of cases have occurred in eastern countries and where rice has formed the bulk of the diet. Some outbreaks have been under observation in North America; in these the use of rice was not necessarily a factor but the ration was always monotonous. Some years ago it was shown that a condition analogous to beri-beri can be induced in pigeons by feeding them for a long time on 'polished' rice, that is to say on rice without the pericarp. The inclusion of the husk with the kernels was found to prevent the disorder.

As a result of extensive studies, Casimir Funk feels warranted in making quite definite statements concerning deficiency diseases. He has evidence that the multiple neuritis of birds, apparently identical with beri-beri in man, is due to the want of a specific chemical compound. This is of no great complexity and its formula can probably be regarded as fixed. It is proposed to call it the 'vitamine' of beri-beri. The term is a good one since an amine is a nitrogenous compound of a certain type and the prefix conveys the idea that it is one which is necessary to life. The vitamine which saves from beri-beri is obtainable not only from the husk of rice but from flesh, potato, and yeast. Scurvy, which has affinities with beri-beri, is believed to be warded off by its own vitamine, the presence of which in certain articles makes them anti-scorbutics.

It seems probable that there are several substances which merit the designation of vitamins. Their function in the organization of the protoplasm may be compared with that of the bolts and rivets in a mechanism. They are but a small fraction of the whole, yet its integrity depends absolutely upon them. The call for such supplies must be more urgent during the period of growth than later, but it never ceases altogether. In this respect the vitamins are closely comparable with the mineral salts in relation to nutrition and also with the internal secretions dealt out by the ductless glands.

Seventy-five years ago it was urged by the gifted Sylvester Graham that food products should not be excessively refined lest necessary components be lost. The unbolted flour with which his name is associated was recommended by him upon this principle. The empirical teaching seems now to have some scientific basis. It is seen to be important that our diet be inclusive and varied. Not long ago it was hard to understand why two rations equal in nitrogen content and fuel value should prove quite unequal in their sustaining power. Crichton-Browne assailed the diet approved by Chittenden by pointing out that it furnished about as much protein and about as many calories as the 'punishment ration' of a British prison. We can see now that *kind* as well as *quantity* of protein, *variety* as well as *amount* of the minor constituents must always affect our judgment in any such comparison.



## FOUR CASES OF THE UNILATERAL ROTARY DISPLACEMENT OF THE CERVICAL SPINE.

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By HENRY J. FITZSIMMONS, M. D., of Boston.

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Within the past year, four cases, which I believe represent a class that is very often unrecognized or incorrectly diagnosed, have presented themselves to me for treatment. These are illustrations of an affection in which I have taken an interest, and upon the history and treatment of which I have spent some study. The cases are as follow.

CASE I.—A girl, æt. eleven, with a good family history and whose past history revealed nothing which could have influenced her present condition, was brought to me. Four months before, the child had been operated upon for disease of the left mastoid. Her recovery was unusually short and without complications, except that she has had a persistent 'twist of her head,' which was observed after the operation. Her wound is now healed and she is without local symptoms. The child was normal in appearance except that she carried her head bent towards the left and her chin pointed towards the right shoulder. On closer examination, this well-developed and well-nourished child showed the pupils equal and reacting to light and distance, mouth normal, no enlargement or redness of the tonsils. Posterior pharyngeal walls were negative. Her heart was normal in outline, and no murmurs were made out. Her lungs were resonant, without areas of dullness, or râles. Her abdomen was negative and all reflexes normal. A careful neurological examination showed that no nerve lesions could account for this deformity of the neck, as the child stood with both shoulders parallel with the floor. Her chin turned towards the right shoulder with some increase prominence of the outer edge of the left trapezius muscle. As viewed from behind, the left ear seemed to be slightly higher than the right. In the upper cervical region there was present a decided lack of mobility, but all muscles in this region were comparatively relaxed on the side which would have been necessarily affected to produce the deformity, while those on the other side were in a state of more or less pronounced tension. The flexibility of the entire cervical column was lessened. Passive motion was slightly more restricted toward left than toward right. Insistence in passive motion in this direction caused pain, which was more or less definitely localized in the occipital region. A prominence could be felt on the left side half way between the angle of the jaw and the mastoid process. The child could bend her head laterally to the right a greater distance than to the left, but in both directions the range of motion was less than normal. With the plane of her chin parallel to the plane of the floor, rotation toward the left could be carried but a short distance without a marked tilting of the chin upwards. Rotation attempted in the opposite direction did not cause an upward tilting. In fact there was quite a tendency for the chin to tilt downward whenever the relation between the plane of the chin and the plane of the floor became other than parallel. (Radiographs of the cervical region showed a displacement of

the right inferior facet of the atlas backward upon the right superior articular facet of the axis.)

CASE II.—This patient, a girl, *æt.* eight, had a family history and past history, both of which were of no consequence in relation to the present trouble. This child while at play, some four months before being seen, had jumped a distance of 5 ft. into a sand pile. Instead of landing on her feet, she some way or other landed on her head. The accident did not cause unconsciousness, but the little girl remembers quite distinctly having had a marked pain in the back part of her head. Following her injury, she had a marked infection of the throat, and the 'twist in her neck' was attributed to this condition. The child, when first examined, was well developed and well nourished, with equal pupils which reacted to light and distance. Her mouth was negative except for marked hypertrophy of the tonsils. Her heart and lungs were negative, and her abdomen, except for slight protubance, could well be classed as negative. In this case also, the neurological examination showed that nothing of a neurological nature was present to account for the existing deformity. The child stood with her right shoulder slightly lower than her left, and with her head turned toward the right and her chin also turned in this direction. There was no contracture of either sternocleidomastoid muscles, nor of any other muscle which might produce the deformity. Passive motion was fairly free in all directions, but was slightly limited towards the left as compared with the right. The chin could be maintained parallel to the floor in rotation to the right; towards the left, a marked upward tilting occurred. The transverse process of the axis on the left appeared higher and more prominent than normal.

The radiograph showed a rotary displacement to the right between the axis and the atlas.

CASE III.—A girl, *æt.* eleven, whose family and past history were negative, as relative to the condition of the neck, was seen and gave this story: Yesterday, while playing in bed, she fell out, striking on her head. The injury caused her to be dazed, but did not render her unconscious. At that time she had marked pain in the back of the head and complained that she was unable to turn her head, it being held stiffly towards the right shoulder. The pain was severe, and has continued localized to the right side of the neck. The parents, at this time, noticed also a prominence in the left side of the neck below and posterior to the ear.

On physical examination, this patient was a well-developed and well-nourished girl with good skin and apparently good intelligence. Her eyes reacted to light and distance. Her ears were normal, and her mucous membranes of good color; tongue clean; throat negative. No prominence or other pathological condition was observed. She held her head tilted towards the right shoulder with her face pointed in the same direction. There was a distinct prominence in the left posterior triangle. Her neck was held stiffly, but rotation was possible to a certain extent to the right. This rotation was also possible towards the left, but was limited in extent. The distance of possible rotation to the left was markedly less to the left than was the possible rotation to the right. It was possible also for the child to bend the head to the right shoulder, but not to the left shoulder. On palpation a marked tenderness, in the region below the point of the mastoid process and toward the median line on the left, was found. Examination of the chest and abdomen was negative; her extremities were normal; reflexes present and not increased. The radiograph showed a slight displacement of the right inferior articular facet of the atlas backward in its relation to the corresponding superior articular facet of the axis.

The child was placed in bed with her head held between sand bags and given  $\frac{1}{2}$  gr. morphine sulphate. She soon went to sleep and slept during the night soundly and without waking. In the morning it was found that all pain had left, and that she now could rotate her head in all directions freely without pain. There was no twist to neck; side bending was possible towards the left as well as towards the right shoulder. A Thomas collar was applied and patient discharged. Some weeks later an examination was made and revealed no abnormal limitation of motion or any deformity.

CASE IV.—A boy, *æt.* six, who fell from a moving automobile, landing upon his head and shoulders, seven days before being seen. He immediately became unconscious and remained so twenty minutes, but slept without trouble that evening. He was put to bed; no nausea or vomiting. The next morning his condition was excellent, except for a stoop of the spine and head, and that he held his head toward the right.

The examination showed a well-developed and well-nourished boy; pupils reacted to light and distance. His general physical examination was negative. Locally, he showed rotation more free to right than to left, but restricted in both directions. The head was held with chin high and pointing slightly toward the right. He stood with increased dorsal flexion. Slight superficial glands were present in front of the left sternomastoid muscle which are somewhat soft with a feeling of fluctuation. Both sternomastoids are tense. Pain and vague tenderness are present on the right side of the neck and shoulders. The radiograph showed what I considered a displacement of the inferior articular facet of the atlas, forced inward on both sides,—slightly more so on the left than on the right,—in relation to the corresponding superior articular facets of the axis. The boy was placed in bed with a pillow under his shoulders and slight traction on his occiput. Three days later the examination revealed an absence of all clinical symptoms, and a painless freely movable cervical spine.

These cases illustrate a symptom-complex from which a diagnosis of this type of 'twisted neck' can be made:—

1. Inability to rotate the head without tilting the chin on the side affected.
2. Prominence of the transverse process of the axis on the side affected.
3. The presence of occipital pain to any degree.
4. The absence of muscle contractions which could explain the deformity and restriction of rotation.
5. Absence of nerve lesions.
6. Radiographic confirmation of cervical displacement.

Some years ago, the work of Dr. G. L. Walton presented strong evidence that in cervical displacements forcible traction was useless. He advocated the manipulation in which, by extending the head diagonally in the direction between the backward line and the lateral line on the side of the convexity, the lateral process and the lamina of the vertebræ furnish a fulcrum by means of which the misplaced articular process is readily lifted. A slight rotary movement completes the reduction. In these cases success has attended this method universally.



In addition to Dr. Walton's work, the history of patients, in which spontaneous reduction of the dislocation has occurred, shows in all instances that force has not been a factor in the reduction. In Cases III and IV spontaneous reduction evidently occurred.

Cervical deformity of this type, whether persistent or self-reducing, is much more common than is supposed. Recently in analysing 100 cases of torticollis, I was led to doubt a group of cases which failed to offer either an anatomical or pathological basis for the existing deformity. It is in this group of cases that I feel a more careful study will find many examples of unilateral displacement between two of the cervical vertebræ. Unilateral rotary displacements between the atlas and the axis may be divided into two classes: Those with, and those without sufficient displacement to give cord symptoms. The diagnosis of the first class is generally made. In those without cord symptoms, a class which is much more frequent, a diagnosis is not correctly made often enough. By unilateral displacement of the atlas on the axis, I mean displacement of the inferior articular process on one side of the atlas from the corresponding superior process of the axis. There are probably many cases of this kind of dislocation, with practically good recovery, which have not been recognized as such on account of the lack of paralytic symptoms, and owing to the comparatively comfortable condition of the patient. The anatomy of the upper cervical spine is so important and makes the lesion of the upper cervical vertebræ understandable and in so doing offers the only sound basis for diagnosis and treatment that I have felt it necessary briefly to review the anatomy of this region.

The first cervical vertebra or atlas has no body and no spinous process. It consists of two lateral masses which support the articular and transverse process and are united by two bars of bone, the anterior and posterior arches. The anterior arch is the shorter and the stouter. On each lateral mass the upper surface is excavated, forming an elongated oval facet, concave from before backward and inclined obliquely inward. These are for the reception of the condyle of the occipital bone. Nature has in this articulation provided a firm union which cannot easily be displaced. The plane of the occipito-atlantal articulations is such that force, in the direction of the long axis of the body, cannot cause dislocation, while force applied in a lateral direction must be sufficient to overcome the resistance of the concavity of the superior articular facet of the atlas. It is not uncommon to find cases in which there is partial or complete fusion between the atlas and the occipital bone. In a rather cursory study of specimens, I have seen 9 such cases in our pathological museum. The inferior articular facets are placed on the under surface of the lateral masses and are of circular form with a side to side concavity,

yet flat in the anteroposterior direction. They are so placed that the surfaces incline downwards and slightly inward. The result is a somewhat insecure pair of facets to rest upon an equally insecure pair of facets which are on the superior articular processes of the second cervical vertebra.

In the second cervical vertebra or axis the odontoid process projects upward from the superior surface of the body. The anterior surface of the body has a raised triangular surface which ends superiorly in a ridge passing upward to the neck of the odontoid; has pedicles which are concealed above by the superior articular process. Over the pedicles and the anterior root of the transverse process are the superior articular surfaces. The shape and relationship of these are important in view of what appears to me the reason for the frequency with which dislocations are caused from slight trauma at this junction. The superior articular surfaces of the axis are more or less circular in shape, slightly convex from before backward, but flat from side to side with the direction upward and a little outward. The groove, by which the second cervical nerve leaves the neural canal, crosses the lamina immediately behind the superior articular process. One can readily see, in this close relation, an anatomical explanation for the nerve symptom found in the occipital region in some of the displacements at this articulation. The cranial articulation, in relation to the odontoid process, requires no detailed description here, since I do not believe that this process plays an actively important part in preventing or permitting lateral rotary displacement, to which type of displacement I wish to confine this paper particularly.

The two articulations between the atlas and occipital bone permit movements in the transverse and the anteroposterior axis. The occipital condyle, as I have pointed out, being convex, fits into the biconcave superior articular surface of the atlas, while the plane of the floor is horizontal. Beside the scapular ligament of each articulation there are the following supplementary ligaments: the anteroposterior-occipital atlod ligaments, both strong but thin membranes; the posterior-occipital axoid, which is within the neural canal; and the middle and two lateral odontoid ligaments, which are preventative instruments to abnormal mobility and are common both to atlas and axis, and may be regarded as a continuation of the posterior common ligament of the vertebral bodies.

Between the atlas and the axis there are three freely movable joints; two, which are important for our consideration, are laterally placed and possess sliding possibilities owing to the flat nature of the articulatory surfaces. One between the smooth anterior surface of the odontoid process and the articular facet on the posterior aspect of the anterior arch of the upper cervical vertebra is mesial. The capsular ligaments of each of these in the lateral

joint thicken into distinct bands and become really accessory ligaments. The anterior and posterior atlo-axoid ligaments here also aid the union. I omit any special discussion of the consideration of the transverse ligament of the atlas, for the same reason that made the detailed consideration of the odontoid process unnecessary.

The movements of the head are flexion and extension at the occipito-atlantal articulation with lateral movement and rotation at the atlanto-axial joint. The nature of the movement at each joint is mechanically determined by the anatomy, and the explanation lies in the shape of the articulating surface. The muscles that cause flexion and extension of the head are, according to most anatomists, the digastric, stylohyoid, stylopharyngeus, mylohyoid, hypoglossus, sternohyoid, sternothyroid, omohyoid, recti capitis antici (major and minor), sternomastoid, splenius capitis, trachelomastoid complexus, obliquus inferior, recti capitis postici (major and minor). For these movements the muscles of both sides act together.

Lateral movement is performed by the sternomastoid, splenius capitis, trachelomastoid complexus, obliquus inferior and the recti capitis lateralis. Rotation being performed by the sternomastoid, splenius capitis, trachelomastoid complexus, obliquus inferior and superior and the recti capitis (major and minor). For these movements the muscles in general act on one side only.

The affection in question, however, is one which involves skeletal anatomy rather than myology. It is upon this point in particular that it is to be differentiated from those types of torticollis in which muscle spasm plays a part, and which require operation for successful treatment. A preliminary examination, which shows relaxed muscles on the side towards which the twist exists, should at once raise the question of cervical dislocation. The study of the natural skeletal arrangement, its possibilities in flexion, extension and rotation, and the genuine understanding of the shifting leverage in this region of maximum movement in the vertebral column cannot be too greatly emphasized. Familiarity with the structures concerned makes a manipulation, which though delicate, very simple, and the deformity may be corrected completely and immediately, as is the case in the prompt return to position of any dislocated joint.



SOME AFFECTIONS OF THE BLOOD-VESSELS WHICH MAY  
BECOME SURGICAL.

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It is my purpose at this time to consider a group of cases which may lead to gangrene of the extremities, and therefore require surgical treatment.

These cases for purposes of clinical consideration may be divided into three groups.

In the first group will be placed Raynaud's disease, with the allied affections, such as erythromelalgia, acroparesthesia, multiple neurotic gangrene, and acro-asphyxia.

In this group there is no organic change in the blood-vessels but marked vascular change. These affections occur most frequently in young neurotic women, and their manifestations are often symmetrical.

Taking Raynaud's disease as a type, the vessels most frequently implicated are those of the fingers, rims of the ears, tip of the nose, and cheeks, although the vessels in the lower limbs, especially those of the feet and toes, do not always escape.

The process is usually primarily manifested by coldness of the fingers, which are usually white, stiff and numb (dead fingers). There is usually an aching pain in the fingers, which at times is very severe. The ischemia frequently alternates with erythemia. Trophic processes occur; blebs form, followed by ulceration, and occasionally by gangrene; or the tips of the fingers or thumb may shrivel, become hard and almost horny. With the advent of marked trophic changes, the pain is usually increased. The condition is thought to be due to some affection of the vasomotor and trophic centres.

In the second group may be placed thrombo-angitis obliterans of Buerger. If we follow Buerger, the pathology is represented by the formation of a limited thrombus in the anterior and posterior tibial arteries and veins. The peroneal vessels usually escape. There is an absence of pulsation in these vessels, as well as in the dorsalis pedis. In the vessels indicated, the intima is thickened, while the media and adventitia are infiltrated. Often the first symptom of disease is the cramp-like pains in the calves of the legs on walking. With rest, the pains disappear (intermittent claudication). Following the pains in the calves of the legs or as

an initial sign, the toes become blue, mottled, and cold, when the foot is dependent. If the foot is raised, the color becomes more normal. After a time ulceration sets in, followed by gangrene. With the advent of ulceration the pain in the toes often becomes excruciating. A sign of diagnostic importance is a migrating phlebitis of the superficial veins of the legs.

The disease is said to occur almost exclusively in Hebrews and Poles of middle age or even in youths. The causative factors of this disease have not been determined; aside from racial conditions it has been thought by some to be due to excessive cigarette smoking, by others to slowing of the blood-current in the extremities from mechanical causes, and, possibly, to some toxic substance circulating in the blood.

Buerger says that in many cases the signs and symptoms of Raynaud's disease and thrombo-angitis obliterans are so intermingled that a correct diagnosis may at first be difficult or impossible.

The third class may include arteriosclerosis, endarteritis obliterans, and diabetic gangrene. The pathology is here represented by narrowing of the lumen of the vessels from a thickening of its coats. The condition often leads to gangrene from mechanical causes, and is spoken of as senile gangrene. Gangrene from thrombo-angiitis obliterans is spoken of as juvenile gangrene.

In this connection I should like to report 2 cases that have recently been under my care.

CASE I.—V. J., a Pole, male, *æt.* forty-four, mechanic; denies venereal disease; never smoked; always well until January, 1914, when he commenced to suffer severe pain in the little toe of the left foot. The toe became purplish and the foot cold. The pain disabled him from work. In March, 1914, the toe was amputated on account of gangrene. The healing was without incident, but slow, and the pain disappeared.

The first part of November, 1914, he experienced severe pain in the third and fourth toes of his right foot. The foot was cold and the toes dark. Ulcers appeared between the toes. I was consulted December 1st. The foot was then cold, and the toes dark and mottled. There was no pulsation in the vessels below the knee that could be determined. The pain in the toes was excruciating, preventing sleep and requiring large doses of anodyne. On December 4th I made a lateral anastomosis between the femoral vessels. The vessels seemed normal. Following the operation, pulsation was distinct in the dorsalis pedis vessel. The following day the foot was warm, and the pain less severe. The patient did very well for five days; on the sixth there was some swelling in the thigh. On the seventh the swelling had increased, and there was some pain. The dressings were then removed and the wound opened. Two or three small openings in the suture line allowed smart hemorrhage. The thigh upon the inside and about the vessels was distended with fluid and clotted blood. The anastomosis was separated, the vein double ligated and divided, and the wound in the artery re-sutured. The wound in the soft tissues was drained, but healed readily. The foot remained warm, and the circulation seemed good.

On December 21st the two toes which had fallen into gangrene were amputated. The wound healed rather slowly, but allowed the patient to be discharged from the hospital after ten days.

On March 15th the patient came to my office complaining of great pain in his left foot just above the seat of the amputation of the little toe. The area was dark purplish. The patient begged for the same operation that he had had on the right leg, saying that he could not endure the pain, and feared gangrene. At this time the condition of the right leg was very satisfactory.

On March 18th the femoral vessels in the left leg were exposed, with the intention of doing an arteriovenous anastomosis. The artery was large and as hard almost as a solid cord. It looked like a piece of clothes line. Only slight pulsation could be made out. The vein lay directly behind the artery, and was varicosed, and at one point considerably dilated. On account of the condition of the vessels, it was thought unwise to attempt an anastomosis, and the vein was double ligated and divided, and a portion preserved for microscopical study. This showed a thickening of the intima.

Up to date the patient has made no further complaint. He walks about with a cane, but his legs are edematous and swollen. This man is so nervous that he reminds one of a neurotic woman of the most aggravated type. When he returned to me on March 15th he complained of his left hand, which, when dependent, was cold and dark, with diminished pulsation in the vessels.

CASE II.—Mr. G., German, *æt.* forty-nine, says he has smoked and chewed since he was fourteen. Drank moderately. States that a cold always affected him severely. Four years ago, while in Denver, he had a severe attack of vertigo, which kept him in bed one week. Shortly after this, on taking a long walk he suffered severe cramp-like pains in the calves of his legs. These pains (intermittent claudication) would become so severe on walking, that he would be obliged to sit down and rest. With rest the pains disappeared.

January 1st, 1914, severe pain occurred in the left foot. All of the foot was cold—he stated, as cold as ice. The toes at this time were dark purplish. During this period the superficial veins in the calf of his leg became thrombosed. The last of February gangrene set in and the foot was amputated. In May reamputation in middle third of thigh. Healing prompt.

June 29th, 1914. Great pain in right foot. I saw him the first part of January, 1915. At this time there was an ulcer on the side of the fourth toe, which extended to the bone. There was no pulsation in the dorsalis pedis artery. The toe was the seat of excruciating pain. On January 4th, toe amputated. Wound healed slowly.

I visited this man April 19th. He got out of bed at ten o'clock in the morning and walked on crutches into the room in which I was sitting. When he reached me the foot was glossy and crimson red. When he sat down and put his foot up, it became almost normal in color. The foot is generally cold. When the foot hangs down the veins seem well filled. He says that the foot is usually red when it hangs down. The man seems extremely high-strung and quick-tempered.

In which of the three groups are we to place these patients?

The first patient was a Pole. There was an absence of pulsation in the vessels of the legs. The toes were dark. Ulceration and gangrene set in. These are the signs and symptoms of thrombo-angitis obliterans. But when the deep vein of the right leg was ligated, pulsation in the dorsalis pedis occurred, showing that the vessels of that limb were not thrombosed. Then again, when the



vessels of the left leg were exposed, the artery was found to be in an advanced stage of arteriosclerosis. But here again, as soon as the vein was ligated, pulsation appeared in the dorsalis pedis artery. This man, as stated, was highly neurotic.

The history of the second case, excepting the race, is, I believe, typical of thrombo-angitis obliterans as described by Buerger—intermittent claudication, absence of pulsation in the vessels of the extremity, toes cold, dark, pain severe, gangrene, amputation above the knee, left leg. Gangrene occurs in toes of right foot. No pulsation in dorsalis pedis, yet when the foot is depended it becomes scarlet red. In this case there is a very marked vasomotor disturbance, with dilatation of the capillaries on standing.

In the treatment of threatened gangrene or actual gangrene, causative factors have received but scant attention. The treatment thus far practised may be divided into conservative and surgical.

Among *conservative* methods may be mentioned rest in bed, warm saline baths, intermittent hot and cold baths, hot air baths, electricity, diathermia, and subcutaneous injection of Ringer's solution—or saline solution, Koga.

*Surgical Measures.*—In the past these have been largely confined to ablation of the offending member. More recently, and especially following Carrel's work on blood-vessel suture, many surgeons have endeavored to save limbs threatened with gangrene by doing an arteriovenous anastomosis. Carrel claimed that in a dog by suturing the proximal end of an artery to the distal end of a vein, the blood current could be reversed. He is supported in this contention by Wieting, Bernheim, Goodman, and others.

Four methods of anastomosis have been practised; end to end, lateral, end to side, and by intubation.

Clinical success is claimed in about one-third of the cases operated. And by clinical success is understood an arrest of gangrene, with healing, disappearance of pain with restoration of heat, function and sensation.

A number of surgeons (Hubbard, Wieting and Bernheim) have noticed arterial bleeding from the veins during an amputation, subsequent to an arteriovenous anastomosis.

Coenen has perhaps been the most pronounced in his opposition to this operation. He asserts that the procedure is practically worthless clinically, and wrong both anatomically and physiologically; that the valves in the veins cannot be forced, and that the blood instead of reaching the periphery is shunted off through the first collaterals and returns to the heart.

In order to determine, if possible, the value of the operation, Drs. Horsley and Whitehead did an end-to-end anastomosis between the femoral vessels in 12 dogs. In 4 of these the dogs were

bled to death, and a fifth died of influenza. In these 5 dogs the femoral artery just above the anastomosis was injected with cinabar in a solution of gelatin. It was assumed that more than the normal blood-pressure force was exerted during the injections. The extremities were then *x*-rayed. These pictures showed that in 4 dogs the cinabar solution had reached a short distance below the knee and then returned through the collaterals. In the fifth dog the solution had extended practically to the foot.

Dr. DeWitt Stetten, in order to test the permeability of the veins to a reversal of the blood current, experimented with limbs that had recently been amputated for gangrene. He used an emulsion of red oxide of mercury in paraffin oil. The injections were made in the popliteal vein. The force was intermittent, with a hand syringe, and continued for several minutes. The vein was then ligated, and the limb radiographed.

In 17 cases the injection ended just above or just below the knee. In one case it reached the foot. In these limbs, when the supposedly occluded artery was injected, the emulsion reached the smallest terminal capillaries.

According to Stetten, in 136 published cases of arteriovenous anastomoses, there were 30 immediate deaths, 11 additional deaths following amputation, while there were but 26 successful cases.

Ligation of the femoral vein for threatened gangrene was first proposed by Hesse and von Oppel. It was carried out by Lilienthal, in 4 cases, with marked improvement in the symptoms. In one case Lilienthal ligated the superficial varicose veins of the leg for impending gangrene, with excellent results.

Those who are opposed to the operation of arteriovenous anastomosis and hold that the blood current cannot be reversed, must admit that there have been at least 26 clinically successful cases. I believe this success may fairly be assigned to three factors, either singly or combined. First, those who favor the operation claim that the blood current can be reversed, and that the success of the operation is due to this reversal.

During the past winter and spring in Dr. J. Van de Erve's laboratory of experimental physiology in the Marquette University Medical School, Dr. Kramer and I experimented with this operation on a large number of dogs for the purpose of developing, if possible, a technique, and also to satisfy ourselves with regard to the advisability of the operation.

In some cases where an end-to-end anastomosis was done, we either immediately or after one or more days, dissected out the veins of the thigh and leg nearly to the foot. On closing the vein distally, and opening it proximally, bright arterial blood, mixed with venous blood, flowed from the wound. The nearer we came to the anastomosis, the greater was the proportion of arterial blood.

The amount of arterial blood circulating in the vein seemed much diminished when we did a lateral anastomosis.

The second factor which has been suggested as favoring clinical success in this class of cases is the backing back of the venous blood by the force of the blood-stream, in cases where anastomosis has been done. This backing back of the blood in the veins increases the pressure in the capillary system, and also retains the blood for a longer time in the capillaries, and thus favors nutrition of the tissues. I take it the same principle is applied when we ligate the enlarged and varicose internal saphenous vein for the relief of pain in the leg and for the cure of a chronic ulcer—so-called varicose ulcer.

The third factor, which I would suggest, is the possible correction of the vasomotor disturbance, which I believe is present practically in all cases excepting those of senile gangrene.

If we take Raynaud's disease as a type of a class of affections, we find at least one of the principal causative factors is a profound disturbance of the vasomotor system of nerves. The same is probably true of many of the cases of so-called thrombo-angiitis obliterans. Here, a strong neurotic condition, with marked disturbance of the sympathetic system is often present. By switching the circulation from the arteries, which are chiefly affected, to the veins, which are affected but little, we may presume that one of the chief factors of the disease would be overcome.

After a careful reading of the literature on this subject, and a study of the reported cases, I feel that practically little thus far has been positively established in regard to the operative treatment of impending gangrene of the extremities.

I also am impressed with the belief that much may be gained by further investigation and experimentation, and that in the future we will do fewer amputations for gangrene than we have done in the past.

Another condition we all have frequently met with is that of a heart embolus carried to one of the larger vessels in the leg which it plugs, producing gangrene of the limb below the obstruction.

The embolus is most frequently arrested in the popliteal where the artery becomes narrowed from the giving off of many muscular and articular branches, or it becomes arrested at the point of origin of the anterior tibial.

In some cases the embolus gets no farther than the femoral at the site of the giving off of the profunda femoris. The condition is usually readily diagnosed because the symptoms are typical, the patient usually for years having suffered from some heart affection. The heart is dilated, there is endocarditis and the valves are seriously involved; then without warning, the patient is seized with excruciating pain in one of the lower limbs. If the popliteal is



plugged the pain would be at the knee. The limb is pulseless, cold, ischemic or occasionally mottled, with disturbance of sensation and loss of function.

In the past, the rule has usually been to wait for the line of demarcation to form and then amputate.

The risks of amputation above the knee in this class of cases is very considerable and the loss of a limb is certainly a great misfortune to any person. I am confident that with an early diagnosis followed by immediate arteriotomy and extraction of the clot, many of these limbs could be saved.

I desire to report the following case, one of many that I have seen, but the only one in which I attempted the extraction of the clot.

CASE III.—Mary S., *æt.* forty-five, suffered for several years with heart disease. Heart greatly dilated; valves incompetent; pulse frequent and irregular. During the afternoon of October 8th, 1913, she was suddenly seized with agonizing pain in the right limb at the knee. The limb became cold and apparently lifeless. I saw this patient October 7th, about twenty-six hours after the lodgment of the clot. No pulsation could be felt below the knee. The greatest pain was in the popliteal region; the leg was cold, somewhat mottled, with sensation and function below the knee arrested. I was only able on the following morning to gain the patient's consent to an operation. She was then sent to St. Joseph's Hospital, and an incision made over the popliteal vessels; an indurated area in the artery was readily felt. The artery was clamped off above and below the obstruction and incised. The embolus showed directly beneath the incision, it was seized with forceps, and about 2 in. of embolus and clot removed. On taking off the clamp distal to the incision, the artery did not bleed any appreciable amount, showing that the vessels were plugged further down. I then passed a probe into the posterior tibial for some distance but could not establish a return flow. I tried to milk the vessel below the incision, but did not succeed in forcing out any more clot. The wound in the artery was then sutured and the proximal clamp removed. There was no bleeding from the artery but vigorous pulsation occurred below the incision. The wound was closed and heat applied in an effort to preserve the vitality of the limb, but in this we failed, and on November 29th the limb was amputated above the knee. The patient made a good recovery.

Had we been able to extract this clot much earlier, the result might have been different. Arteriotomy for the extraction of an embolus has been done a number of times successfully. The principle is correct, and I believe in this class of cases with an early diagnosis followed by immediate operation, very many of these limbs could be saved.

## A POSITIVE METHOD OF CURING PURULENT INFECTION. AN APPEAL TO THE ARMY SURGEON.

By CHARLES H. DUNCAN, M. D., of New York.

Five years ago the writer gave the profession a new and simple method of curing purulent infection, which he called 'autotherapy.' "Since then, much water has flown under the bridges," and to-day, after crucial clinical tests without number, it is being used successfully by many hundreds of physicians in all parts of the world. By many it is claimed to be the best method, and the only method of curing many profoundly septic conditions.

It is difficult to select cases to report from the infinite number that can be given, or to give an intelligent idea of the great therapeutic value of autotherapy in purulent infections.

Time and space forbid that more be given here than a few cases which show not only the technique of the application of the principle of autotherapy in purulent infection but the results that may be confidently expected to follow its use.

Dr. Andrew B. Gloninger, of Lebanon, Pennsylvania, reports the following case:—

CASE I.—"The patient, a young man, farm laborer, living in a wretched mountain cabin. I found him tympanitic and profoundly septic. It was impossible to move him, and though the surroundings could not have been more unfavorable for surgical work, we put him on a kitchen table and operated. I found the appendix and a large portion of the omentum gangrenous, and a quantity of thin serous pus free in the abdominal cavity. After the operation, his pulse was weak and thready, and he looked as though he would not survive the day. I gave him half a teaspoonful of pus per os while under anesthesia, and took some to the office from which I made a filtrate according to your method. I sent this back to the nurse with instruction to give him 1 c.cm. every three hours. The next day his temperature was normal, and he made an uneventful recovery."

The writer commends giving pus by the mouth while the patient is under anesthesia in abdominal operations. It is good autotherapeutic treatment. In many cases this is all that is necessary to cause the wound to heal promptly with no apparent infection.

CASE II.—Patient, baby, aged eighteen months, had infected its finger eight weeks before it came under my care. Four physicians recommended the finger be amputated to save its life. The finger was enormously swollen. The wound from a former incision was open, exposing the three phalanges. The sides of the wound were purple, and exuded a thin, serous, sanguinous discharge. The child was in poor physical condition and screamed the greater

part of the night. Treatment: The wound was cleansed with boiled water and dressed with sterile gauze. In twenty-four hours this was removed, and the stained part placed in an ounce of water, and thoroughly shaken. The decanted fluid was given the patient to drink. This was done every other day. The pain ceased within a few hours, and the child slept the remainder of the day and the night following. In twenty-four hours there was no more pus, but the gauze stuck to the wound. In forty-eight hours healthy granulations made their appearance; in seventy-two hours healthy granulations covered the sides of the wound.

In four weeks the patient was discharged cured. There was still ankylosis induration at the seat of the former infection."

The quick cessation of pain, and the immediate reduction of swelling and stoppage of pus are characteristic of this treatment. The more virulent or active the infecting micro-organisms are, the quicker the response and cure. The pain often leaves as by the action of morphine.

CASE III.—Dr. J. Wilford Allen, of New York City, reports the following case: "Patient, a young man, was first seen by me suffering with an orchitis resulting from gonorrhea, contracted four months previously. He was in bed with a temperature of 104° F. The testicle had ruptured, leaving a sinus, in which was a gauze drain an inch long. The inflammation was rapidly extending and peritonitis was at hand. Dr. Buck Carleton, genito-urinary specialist, was called to see the case. He recommended immediate castration to save the patient's life. The patient was in great pain and rapidly growing worse. Operation was refused. Other prescribed methods of treatment gave no relief. I then decided to see what Dr. Duncan's autotherapy would do for him. Accordingly I placed the drain in an ounce of water. It was thoroughly shaken, and allowed to stand for twenty-four hours, after which time it was filtered through a Berkefeld filter and 20 minims of the immunizing bacteria-free filtrate injected subcutaneously over the biceps muscle. In twenty-four hours the pus had disappeared, as had also the pain. The patient said he felt fine. Within an hour after the injection there was excruciating pain in the testicle for about ten minutes, this then subsided and did not return. Three more injections completely cured the case except for a small induration at the seat of the former infection."

The following abstract is taken from an article under the title of "Autotherapy," by Dr. J. J. Sellwood, of Sellwood and Besson General Hospital, Portland, Oregon, that appeared in the *Medical Sentinel* (June, 1914).

"The autotherapeutic technique we use is as follows: One teaspoonful of pus is mixed with 2 oz. water. The mixture is then passed through a Berkefeld filter, and of the resultant filtrate, 1 c.cm. is injected subcutaneously. The result is immediate and most gratifying, both to the physician and patient. This method of treatment is most valuable in both acute and chronic cases of sepsis. In this process of filtration, the infectious element of the pus is eradicated and the immunizing free toxins employed, just as when given by the mouth the stomach digests the infectious element and sets the toxins free in the general circulation. The following 2 cases illustrate the two autotherapeutic methods of treatment. The filtration method is universal in its application to all purulent infections. Pus by the mouth is applicable



only to those infections that are not in any way connected with the alimentary tract and respiratory system.

CASE IV.—Patient, boy, eight years old, suffering with otitis media and mastoiditis following measles. Temperature 102° F., marked edema of the mastoid region; ear standing far from head. Paracentesis tympani done with fair drainage, and amelioration of symptoms for two days, after which he became worse. Under local anesthesia an incision was made down to the mastoid. The next day there was a free discharge of pus from the incision. Five drops of this pus were well shaken into a half ounce of water and a teaspoonful of this mixture was given every fifteen minutes for four doses. The next day there was very scanty serous discharge, several drops of which were given as before. The next day the wound was dry, and the patient quickly recovered with normal hearing. We are certain this patient would have needed a mastoid operation had the above treatment not been given.

The writer's comments on this case are as follow: It is evident that this infection was walled off, so that the infectious element could not escape through the Eustachian tube. If such had not been the case, it would have been necessary to administer the unmodified toxins in the form of the filtrate, hypodermically. If cases like these are treated early by means of autotherapy, otitis media and mastoiditis, sinus involvement, etc., can be aborted and cured quickly. The method of doing this is as follows: Mix one drachm of sputum, *i. e.*, phlegm from the throat (in a child it may often be obtained on a cotton swab by wiping the throat) with an ounce of distilled water. Allow to stand for twenty-four hours. After which time, filter through a Berkefeld filter and inject 20 minims (less for children) of the immunizing bacteria-free filtrate subcutaneously.

CASE V.—(Reported by Dr. J. J. Sellwood.)

This patient suffered with tuberculosis of the knee-joint. It was incised, and by reason of the severe necrotic area, and the patient's general poor condition, it resulted in post-operative infection. For a time it looked as if amputation might be necessary. For two months his temperature ranged from 102° to 104° F. at least once daily. After using the hypodermic method of treatment described above, the patient became normal. Dr. Sellwood states further: "Many more cases could be cited, as these are simply types not only of cases but of results. Two years' experience with a multitude of cases and absolutely no bad results, but on the contrary good results, certainly proves something, and should at least make those of us who are not blinded by personal prejudice, ignorance, or gross asininity see the light of knowledge clearly."

Dr. John Besson, who is associated with Dr. Sellwood says: "I feel that my patients cannot get well nowadays unless I have some autotherapy to offer them, and if it is a case presenting an opportunity for autotherapy I have no concern for the outcome."

CASE VI.—This patient was referred by Dr. von Bonnewitz.

Patient, male, *æt.* thirty-five, had been suffering with furunculosis for some years. Eight months previous to his visit to the office he had to give up work on account of boils on the back of the neck and thigh.

He had become exceedingly sensitive to the continuous pain and was in

a highly nervous state. Ten drops of pus were placed in an ounce of water. This was allowed to stand for twenty-four hours, with an occasional agitation, after which time it was filtered and 1 c.cm. injected subcutaneously in the back. He had four injections five days apart. In two weeks the boils had all disappeared. From a large previous experience, I warned him that he would have a few small ones following the disappearance of the large ones, but that these would heal quickly, and when these disappeared there would be no return. In four weeks he was back to work. There has been no return now over a year.

CASE VII.—A valuable dog escaped from its keeper and jumped into the river. In rescuing him, the keeper was bitten thirteen times on the hands, wrists and arms. He came for treatment forty-eight hours afterwards.

At every tooth mark there was an extensive cellulitis. Both hands were puffed and painful, temperature 102° F. Treatment: I picked off the crusts, and caught the thin serous exudate under them on small pledgets of cotton. These were placed in an ounce of water. This was shaken thoroughly and the decanted fluid given him per os. Within twenty-four hours the pain ceased and the swelling began to recede. In twenty-four hours the cotton from the previous day was squeezed tightly and the resulting drachm of fluid again given him by the mouth. After this treatment the wounds healed quickly.

CASE VIII.—(Reported by Dr. M. Brooks, First Assistant Military and Civil Surgeon, Kondat, India, in the *Indian Medical Gazette*, February, 1915.) Hindu, male, *æt.* forty, was brought to the hospital in a cart. He had a sloughing ulcer of the foot with diffuse cellulitis, and purulent discharge, after a cut that had severed the great toe, except for a flap of skin. Application of hot boracic acid compresses were tried with little effect. Then the treatment of autotherapy was resorted to. A moist dressing that had been previously boiled was applied. The next morning six drops of pus were squeezed out of the dressing and this was given internally in an emulsion of an ounce of water. This was repeated for six days. The suppuration and sloughing ceased and the ulcer granulated from the bottom.

CASE IX.—(Dr. Brooks' case.) European, male, *æt.* thirty-three, developed an extensive abscess of the knee-joint after a fall. This had been opened by a local practitioner. There was a copious discharge of pus from the boggy swelling around the patella, issuing from a small opening that ran down the leg when the dressing was removed. The original incision was enlarged and five drops of pus were mixed with an ounce of water and given the patient night and morning. Twenty-four hours later there was scarcely any purulent discharge, but sufficient exudate was obtained to repeat the internal administration morning and evening. On the third day there was only a slight opaque watery discharge tinged with blood, five minims of which was given only once. A week after the treatment was begun the parts had completely healed.

Free drainage and autoseptic technique will cause almost any non-fatal wound to heal without infection being apparent.

These cases show conclusively that a diagnosis is often unnecessary as far as a cure is concerned. Use nothing on the wound but sterile water (boiled water will do), and sterile gauze (boiled gauze will do). The technique of the application of the autotherapeutic principle varies within wide limits, as the above cases clearly show. The writer has found the following formula useful, and free from

danger in the adult; for very weak patients and children, less should be given.

1. R Pus. . . . .minims 6.  
Boiled water, q. s. ad. . . . .ounce 1.  
Sig. Mix in a bottle, shake well, and give in three divided doses an hour apart. Repeat only when needed.

2. The following preparation will keep if no additional micro-organisms creep into the wound during the dressings; it may often be used until the case is cured.

- R Pus from the wound. . . . .minims 10.  
Sugar of milk. . . . .ounce 1.  
Sig. Mix in a mortar and grind thoroughly for ten minutes. Dose 20 gr. per os. Repeat every fifteen minutes until three doses are given. Repeat only when indicated. In acute conditions it may often be given every day.

3. Wounds of the mouth, nose, esophagus, lungs, larynx, pharynx, etc., or wounds in any way connected with the alimentary canal or respiratory system should be treated by the following technique:—

- R Pus. . . . .drachm  $\frac{1}{2}$ .  
Boiled water. . . . .ounce 1.  
Sig. Mix in a bottle, shake well, filter through a Berkefeld filter and inject 1 c.cm. subcutaneously, at once.

4. At times a half drachm of pus cannot be obtained; when this is so, the following technique may be employed:—

- Pus. . . . .minims 10.  
Boiled water. . . . .ounce 1.  
Sig. Mix in a bottle, shake well, allow to stand for twenty-four hours. After which time it is filtered through a Berkefeld filter and 20 minims of the immunizing bacteria-free filtrate injected subcutaneously.

Formulae Nos. 3 and 4 are universal in their application to all infected wounds.

Many veterinarians just catch the pus in a spoon, or on a flat stick and place it on the animal's tongue. They are unanimous in vouching for the specificity of autotherapy; their leading men claim it would be a crime not to give it to horses.

Dr. D. J. Mangan, Chief Veterinary Physician of the Department of Street Cleaning of New York City, says: "I am saving



the city thousands of dollars annually by the use of autotherapy in the treatment of horses that otherwise would have been shot."

Dr. Walter R. Grutzmann, Veterinarian of the 15th U. S. Cavalry, says: "I am pleased to report to you 15 cases of purulent infection in horses and mules with 100 per cent. cures."

Dr. E. Wilton Brown says: "I have used autotherapy for the past four years. For pus infections no treatment equals it. I have had universally good results."

Dr. Frederick G. Canny, of San Francisco, says: "I have used your method in the treatment of many infections and have produced splendid results. Your filtrates are a great improvement over the vaccines."

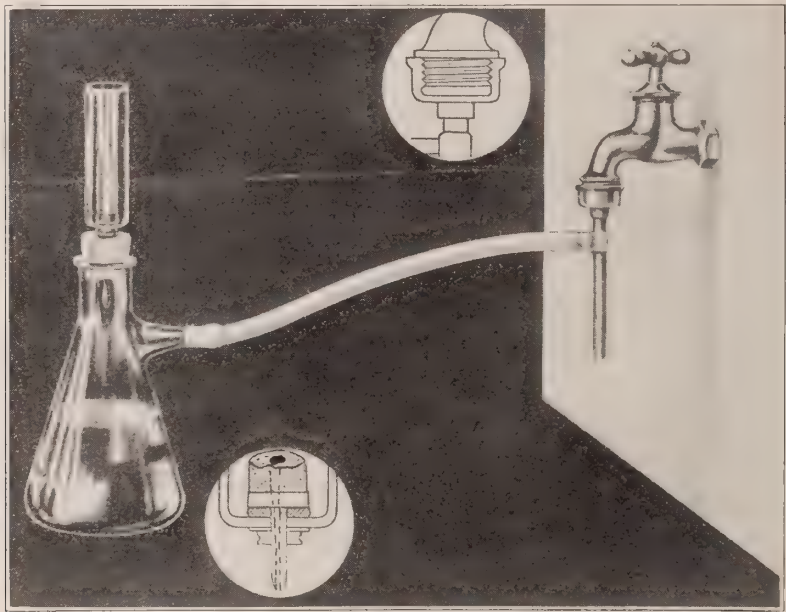
Many physicians who have used autotherapy on themselves as patients, employ the word 'magic' in describing its therapeutic effect.

If the best results are to be obtained in giving the autotherapeutic remedy, the patient should be watched carefully for any change in his condition. Except in very acute conditions, no further dose is given but that indicated in the above formulæ until the patient ceases to improve on the preceding dose; in chronic cases this will often be from the fourth to the seventh day. In from six to ten hours after the injection, the cutaneous reaction will be about the size of a silver dollar or larger. The constitutional reaction is usually slight; the temperature seldom rises above 100° F. After twenty-four hours the cutaneous and constitutional reactions will begin to subside; in forty-eight hours they usually disappear. The pain in the wound will often cease in from one to twelve hours after the toxins are given. In twenty-four hours the discharge will usually be noticeably less. Coincident with the discharge becoming less, it becomes thin and sanguinous and the clinical symptoms will subside. A thin discharge is the indication that the curative reaction is continuing. No further dose is given as long as the discharge is thin. If it becomes thick again, another dose, freshly made, is given. Watch your patient carefully; let him be the guide as to when another dose is needed. No set rules will fit all cases. The doses given are for a strong, healthy man. Never use antiseptics on a wound treated autotherapeutically, for many antiseptics destroy the therapeutic value of the toxins, that is, pus containing some antiseptics is useless for autotherapeutic purposes. When a moist dressing is desired, normal saline may be used.

The prevention of infection by means of autotherapy is so very simple and dependable, that it is remarkable that it has heretofore escaped the attention of the profession.

The patient should be instructed to lick or suck his wound as soon as it is received, and every two to four hours afterwards

for several days. If this is done there will be no more deaths from infection, for the wound will apparently heal by first intention. If from anatomical reasons the wound is inaccessible to sucking and licking, infection may be absorbed by simply chewing for five minutes twice daily the blood-stained cloth covering the wound, swallowing the fluid. This self treatment should be continued for several days until the danger of infection has passed. Preferably the gauze should be sterile, but many clinical tests clearly show that non-sterile gauze is better than no gauze (*Practitioner*, London, April, 1914). A convenient hospital method of preventing infection in fresh wounds is to boil the gauze in normal saline solution and apply it moist to the fresh wound at the



The Duncan Autotherapeutic Apparatus No. 2.

temperature of the body or as much hotter as the patient can stand. At the next dressing the stained part of the gauze is cut out with scissors and placed in a four-ounce bottle of water; it is allowed to stand for half an hour with occasional agitation and the decanted fluid is given to the patient. This should be done twice daily until the danger of the infection has passed. This treatment is absolutely dependable and has been verified daily for many years. For this reason it is commended to the army surgeon with the assurance that the resultant loss of life among the wounded will be reduced to a minimum.

The accompanying illustration has a syphon attached to a water faucet. The syphon is necessary to draw the fluid through the

porcelain part when *mucus* is being filtered for autotherapeutic purposes, and to hurry the process.

In filtering a dilution of pus, the mixture of pus and water may be poured into the top part of the cylinder and allowed to filter through by gravity. Half an ounce will pass through in twelve hours. Give smaller dose, when gravity filtration is employed in technique 3.

In a military hospital, but one filter and two dozen four-ounce bottles and corks is all that is required for every ten beds.

Before being used the porcelain part of the filter should be scrubbed lightly with a moderately soft brush under running water; then boiled for a half hour.

This is fast becoming the standard method of wound treatment in all parts of the world, and it is only a question of time when it will be universally employed by all physicians.

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# MEDICAL AND SURGICAL PROGRESS.

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## TYPHOID VACCINE CURATIVE.

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### A REVIEW OF RECENT LITERATURE.

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By G. A. PERSSON, M. D., of Mt. Clemens, Mich.

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19. Illman, Horton and Duncan: Opsonic Treatment of Disease. (*New York Med. Jour.*, 1908, Vol. LXXXVII, p. 1288.)
20. Allbut and Rolleston: A System of Medicine, 1905, Vol. I, p. 1140.
21. Osler: Practice of Medicine, 1910, p. 50.
22. Wright: Studies on Immunization, 1909, pp. 312-316.
24. Chantemesse: Five Years' Experience With an Antityphoid Serum. (International Clinics, Philadelphia, 1907, Vol. LV, 17th Series, pp. 27-46.)
25. Chantemesse: Serotherapy in Typhoid Fever. (Proc. of XIV International Congress for Hygiene and Demography, 1907, Vol. 1, p. 195.)
26. Fletcher: A Rational Indication for Bacterial Vaccine in Typhoid Fever. (*Jour. Amer. Med. Assoc.*, 1911, Vol. LVI, p. 1102.)
27. Simons: Notes on Cases Treated by Vaccines. (*U. S. Navy Bull.*, 1910, Vol. LV, pp. 46-48.)
28. Grattan (*Journal Royal Army Med. Corps*, February, 1909).
29. Waters and Eaton (*Boston Med. and Surg. Jour.*, April 22nd, 1909).
30. Stone (*Jour. Amer. Med. Assoc.*, Vol. 53, pp. 1253-56).
31. Irwin and Houston (*Lancet*, June 30th, 1909).
32. Callison (*Med. Record*, June 24th, 1911).
33. Persson: An Early Inoculation of Curative Typhoid Bacterins. (*Medical Record*, June 1st, 1912.)

In a recent address before the Royal Society of Arts, Sir Frederick Treves declared that the results achieved by inoculation against typhoid fever in the British Expeditionary Force have been positively astounding: "Since the beginning of the war there have occurred in the British Army, only 212 cases of typhoid fever, and of these 173 occurred in persons who had not received protective inoculation. Only 22 deaths from typhoid have occurred in the British Army during the war; and not one of those who died had been vaccinated. In other words, not a single death from typhoid fever has occurred in the British Army among persons who have received prophylactic vaccination."

In view of the fact that such brilliant results have been obtained from prophylactic measures, it is, perhaps, little wonder that the use of the specific bacterins in the treatment of typhoid fever has received but scant attention, and yet one cannot follow the literature on typhoid vaccine without becoming convinced of its therapeutic value. Those who have reported negative results are very rare, the great majority of observers holding that the use of the vaccine mitigates the severity of the symptoms, produces a lowering of the temperature, and decreases the complications, sequelæ and relapses, as well as the mortality of the disease.

Without attempting to review the numerous articles which have appeared on this subject, as it would be largely a matter of repe-

tition, I wish to call attention to the following table showing the mortality and percentage of relapses in cases treated with vaccine.

	No. of Cases	Relapses	Deaths
Watters and Eaton.....	69	6	2
Hollis.....	51	8	2
Smallman.....	36	0	3
Richardson.....	28	1	0
Callison.....	24	1	3
Sappington.....	22	0	3
Fletcher.....	14	1	2
McLaughlin.....	13	0	0
Behrend.....	12	0	0
Nichols.....	11	2	0
Semple.....	9	0	0
Anders.....	8	1	0
Duncan.....	6	0	0
Wilson.....	6	0	0
Martin.....	2	0	0
French.....	1	0	0
Illman.....	1	0	0
Kennedy.....	1	0	0
Ramsburg.....	1	0	0
Persson.....	1	0	0
Wood.....	1	0	0
Sadler.....	95	*—	15
Elliot.....	3	0	0
Meaking and Foster.....	41	1	1
Goldschneider and Aust.....	57	*—	9
	<hr/> 529	<hr/> 21	<hr/> 41

Percentage of relapses, 4.3.

Percentage of deaths, 6.7.

\*— No. of relapses not given.

The doses recommended by other authors are as follow: Watters and Eaton, initial dose, 30-50 million. In cases evidencing considerable toxemia, lower the doses as low as one million.

Smallman.....	300 to	350 million.
Sappington.....	5 to	50 million.
Richardson.....	10 to	100 million.
Semple.....	8 to	30 million.
Hollis.....	10 to	250 million.
Anders.....	25 to	50 million.
Martin.....	30 to	50 million.
Duncan.....	50 to	1,000 million.
McLaughlin.....	25 to	50 million.
Callison.....		500 million.

Sadler gives the following directions relative to dosage:—

1. In cases with serious cerebral symptoms, whatever the stage of the disease, I start with one million bacilli.

2. After the seventeenth day of the disease, if there is any continuous high temperature (102.5° F. or over), I also start with one million bacilli or less if the patient is in bad condition.



3. To patients under seventeen years of age, my practice is to use as a maximum dose at five years,  $\frac{1}{2}$  million; at ten years 1 million; and at fifteen years  $1\frac{1}{2}$  million.

*Subsequent Doses and Spacing.*—Whatever the initial dose, the second dose should be half the quantity, and given five days later (*i. e.*, after four clear days' interval). I have tried three-day and five-day intervals, and am quite satisfied that the results are not as good as with the four-day interval.

The third and subsequent doses, I think, may be the same as the second, and I continue to inject until the tenth day of normal temperature. This does not prevent relapses, but removes the fear of anaphylaxis should a relapse occur and further injections be required.

It will be noted that Sadler used as the initial dose 1 million killed bacteria. This he believes to be the proper dose in mild cases during the first ten days of the illness. This author, however, has observed injurious effects from the use of 4 million bacteria, even during the later stages. He, therefore, concludes, that "to be on the safe side" it is best not to give a larger dose than 1 million to start with.

Following are his conclusions:—

1. That vaccines reduce the duration and severity of the fever.
2. That they decrease the mortality fully one-half.
3. That they decrease the dangers of relapses.
4. That they are harmless when properly used, even if they do not confer benefit in every given case.
5. That the earlier they are used the better is the prospect of success.
6. That the more severe the illness, the smaller should be the dose.
7. That the method should be a routine one in the treatment of the disease, and should be considered to be an adjunct to all other recognized measures, particularly remedies. It should not be considered to replace any method, but to act conjointly with the others.

Sadler (*Journal of Vaccine Therapy*, January, 1912) treated altogether 90 cases of typhoid vaccine, and found that the use of the vaccine decreased the mortality and shortened the duration of the disease.

*Favorable Influence of Vaccine Therapy.*—Smallman reports 36 cases of typhoid treated with vaccine and believes that it had a favorable influence, shown by the following modifications:—

1. Temperature does not run so high and is markedly lowered by each injection.
2. Absence of typhoid facies.
3. Absence of complications and relapses.

Smallman also states that local lesions are responsive to the treatment. He reports 2 cases of periostitis in which he has had splendid success. He does not believe that the classical twenty-one days can be shortened, but hopes that further experience and improved doses may even bring this about.

Watters and Eaton have apparently had gratifying results in a series of 38 cases treated by typhoid vaccine. In this series the mortality was 3.2 per cent. compared to a mortality of 11.1 per cent. in an equal number of cases treated at the same time under similar conditions without the use of vaccine.

In a family, consisting of a mother and three children, the mother and the two children who had the most severe cases were put on vaccine. The other child, who had the lightest case, was given regular treatment. The 3 cases treated by vaccines were improving moderately, while the case in which the vaccines were not used became steadily worse. Vaccine treatment was then instituted in this case with prompt, beneficial results. Dr. E. E. Allen, under whose clinical observations most of the work was conducted, gave his conclusions as follows: "I will say, however, in the light of my experience, that were I now entering upon another three months' service, I would unhesitatingly give every case the benefit of the opsonic treatment at once, administering no other remedy until it was demonstrated that the case did not respond. . . . As I watched the progress of these cases, I found myself relying more and more upon this new method. It was a very unique and interesting phenomenon to see, repeatedly, apparently serious cases of typhoid fever, presenting all the usual symptoms, rapidly overcome, and in a few days, change the whole complexion of the illness for the better, going on to a rapid convalescence. After but one treatment some of them began to improve immediately in every respect.

"The fever became less, the headache and backache disappeared, the tongue cleared up, and they began to complain of hunger. Most of them would say, if asked, that they felt better, and that also very soon after the initial treatment.

"Vaccine therapy in the treatment of typhoid fever should receive more extended trial, more particularly in the early stages of the mild type of disease. Finally, in the present state of knowledge, the value of vaccines for the following purposes must be conceded:—

- "1. As a means of prophylaxis.
- "2. In suitable cases when continued during convalescence to prevent relapses.
- "3. To combat local infection.
- "4. To remove typhoid bacilli from the feces and urine in cases of typhoid carriers."

Simple claims that administration of typhoid vaccines is a practical therapeutic method of treating this disease. It increases bacteriotropic substances in the blood, as evidenced by increase of opsonic index. He thinks it is devoid of all risk, and produces no apparent disturbance in the patient.

Callison reports 24 cases treated with typhoid vaccine in which he had three deaths, one from femoral phlebitis, one from lobar pneumonia and one from meningococcus septicemia. No case of death from the usual causes occurred in the entire series. This observer thinks there is an absence of complications. His patients lost typhoid facies, seemed brighter, slept better and the appetite returned sooner than in cases where no vaccine was used.

#### CONCLUSION.

The production of antibodies or protective substances, in response to the inoculation of a vaccine, follows definite fixed laws, regardless of whether the vaccine is given for prophylactic or curative

purposes, and the results in treatment must be interpreted in the light of what is known of those laws.

2. Inoculations of vaccine in typhoid fever prevent relapses and lessen complications, and in some cases probably also shorten the original attack.

3. Stock vaccines should be given in preference to autogenous vaccines in typhoid fever. The older the culture the better.

4. When given in therapeutic doses, such stock vaccines are without injurious effect, and do not interfere with other treatment.

5. The routine treatment should be continued until the fever process is controlled by the vaccines.

6. The dosage used by many of those who have treated typhoid with vaccines in the past, has been too small to secure the best possible results.

7. Every case of typhoid fever should receive vaccine treatment as soon as a diagnosis is made, and this should be continued until the temperature becomes normal or it is demonstrated that the case will not respond to this form of therapy.



## DIAGNOSTIC AND THERAPEUTIC NOTES.

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FUNCTIONAL HEART TEST.—Katzenstein (*Deutsch. med. Wochenschr.*, 1915, No. 16). One great surgical desideratum is the ability to foretell how a patient's heart will behave under the strain of a prolonged operation. Katzenstein, himself a surgeon of note, believes that he has found the solution of this problem. By means of an artificial increase in the patient's peripheral resistance, he questions the left ventricle, as it were, in regard to its behavior under unusual strain. If, in an animal, a large vessel is tied off, the heart responds by a great increase in the force of its contractions. The blood-pressure rises, while the pulse-rate remains unchanged. The procedure is applied to the patient as follows.

The pulse is counted at the femoral and the blood-pressure determined at the brachial.

The femorals, covered by the patient's shirt, are firmly compressed by the middle fingers of the physician's two hands, so that both femoral pulses are obliterated, this obliteration being controlled by the two little fingers placed lower down on the arteries. The pressure is maintained for two to two and a half minutes, care being taken not to cause pain.

Thereupon the pulse-rate and the blood-pressure are again determined.

If the blood-pressure rises moderately, while the pulse-rate falls, the heart is normal. If the blood-pressure rises excessively, we have arteriosclerosis with cardiac hypertrophy. No change in blood-pressure or pulse-rate points to slight cardiac impairment, a rise in pulse-rate to a somewhat greater one. A fall of blood-pressure with a rise in the pulse-rate speaks for severe cardiac insufficiency. In such cases no operation should be performed, unless the indication is a vital one.

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TREATMENT OF RIGID OS.—Brand (*British Med. Jour.*, July 17th, 1915). The writer protests against the use of tartar emetic recommended in a previous issue of the *British Medical Journal* for the purpose of relaxing a rigid os uteri in labor, and presents instead a method of his own. A tampon of lint or absorbent cotton is soaked in a solution of cocaine or beta-eucaine, 10 gr. to the ounce of saturated boric acid solution, and is applied to the mouth of the uterus. It never fails to relax the most obstinately rigid os, and, in addition, so anesthetizes the vaginal mucosa as to diminish the discomfort caused by the fetal head as it passes the outlet.

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ASPIRATION IN PLEURISY WITH EFFUSION.—Grober (*Deutsch. med. Wochenschr.*, 1914, No. 29). When shall a pleuritic exudate be evacuated? At once if the amount of fluid is so great as to interfere seriously with vital processes. Always in the presence of bilateral exudates, of which one at least is moderately large, even

though the other be small. Here a partial evacuation of one side usually suffices for the absorption of both exudates. Other non-septic exudates are best left alone; the evacuation of a hemothorax should be done especially cautiously, if at all. Repeated aspiration of serous exudates may be a vital necessity; in milder cases, one must remember that it is apt to encourage the formation of the pleuritic scars.

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TREATMENT OF PYORRHEA ALVEOLARIS.—Gosline (*Boston Med. and Surg. Jour.*, July 22nd, 1915). According to their severity, cases of pyorrhea alveolaris are classified as those with spongy gums, very spongy gums and spongy gums with loose teeth. The treatment advised consists in the administration of emetine hydrochloride,  $\frac{1}{6}$  grain, twice a day subcutaneously, and the application of the wine of ipecac to the gums twice a day for one week, followed by a second week's treatment, in which the gums were swabbed with wine of ipecac, and an injection of emetine hydrochloride,  $\frac{1}{3}$  grain, was administered once a day. Of 14 cases with spongy gums, 11 showed marked improvement, 2 moderate improvement, and one slight improvement. Of the 12 cases of very spongy gums, those treated locally showed only moderate or slight improvement, while those treated with emetine in addition to the local treatment showed 87.5 per cent. marked improvement. The group with loose teeth and spongy gums showed 78.6 per cent. marked improvement, but in no case with loose teeth did the teeth become firmly set once more.

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ROENTGEN RAYS IN HAY FEVER.—Schmidt (*Muench. med. Wochenschr.*, No. 23, 1915). The writer is himself a hay-fever sufferer and had tried all the usual remedies without result. Just before the expected onset of the attack he exposed himself to the x-rays, giving himself one-third of an erythema dose with a hard therapeutic tube. This single exposure seems to have aborted the attack. A second exposure during a subsequent paroxysm was less satisfactory. A female patient was given two exposures, two weeks apart, and, apparently as a result of the treatment was spared her usual outbreak of hay-fever. Further use of the treatment was prevented by the outbreak of the war, but it clearly deserves a trial.

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IODINE POISONING.—Merlet (*Jour. de Méd. et de Chir.*, 1915, No. 3). Attempts at suicide by means of the tincture of iodine are becoming more and more frequent. There seems to be great variation in the dose treated by different individuals, death having followed the ingestion of 6 grm. of the tincture, while 10 grm. have been taken without ill effects, and 60 grm. merely followed by an obstinate gastro-enteritis.

A variety of antidotes have been advocated, but none compares in efficacy with sodium hypochlorite. It may be given, as a 10 per cent. solution, in almost any dose with no untoward action except that of a purgative. More than an ounce need not, however, be given and this amount is without ill effects. A great advantage of the drug is that it may be obtained almost anywhere, in an emergency, owing to its general use in photography. It is also by far the best reagent for removing iodine stains from the skin.

## BOOK REVIEWS.

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**OCCUPATIONAL AFFECTIONS OF THE SKIN.** A Brief Account of the Trade Processes and Agents Which Give Rise to Them. By R. Prosser White, M. C. Ed., M. R. C. S. Lond., Life Vice-President, Senior Physician and Dermatologist, Royal Albert Edward Infirmary, Wigan, etc. etc. New York: Paul B. Hoeber. 1915. Price, \$2.00.

Preventive medicine is massing upon the horizon of cutaneous medicine, as well as in other branches of medical science. External conditions, irritation, sensitization of the skin to various mechanical and chemical irritants has now loomed before us as very important etiological factors in the production of diseases of the skin. In the trades and professions, they cut a prominent figure. Occupational diseases are demanding, for practical reasons, the minds of investigators, and we can look for some striking results in this most lucrative field.

This little volume is one of the very first in the field, and we can gladly congratulate the author upon his effort. He has compiled the greater part of the literature that has appeared upon the subject, thrown it into happy and useful classifications, and made it concise and useful for the student. Such monographs are always very readable and instructive, especially those from English pens, and this one is a good example of its kind. We would advise the general practitioner and the specialist to get the little book and read it more than once; it contains scientific and practical knowledge of great value.

**TRANSACTIONS OF THE AMERICAN CLIMATOLOGICAL AND CLINICAL ASSOCIATION.** For the Year 1914. Volume XXX. Philadelphia: Printed for the Association. 1914.

In this volume are collected the papers read at the June, 1914, meeting of the association. As was to be expected, most, though not all of the papers deal with tuberculosis in its various aspects and some of them are of great interest. In an address on percussion of the lungs, Dr. N. K. Wood calls attention to the need of more accurate standardization of the terms, resonance and dullness, and suggests that the pitch of the note obtained on percussion be used as an indicator. He has found that the notes obtained over areas of normal resonance and of absolute dullness vary quite two octaves. He also urges that the thorax be percussed from below upward instead of, as is usual, from above downward, a suggestion that has much merit. The great variety of the papers collected in this volume forbids a detailed review. It is of interest, however, to note that, in a paper on functional myocardial tests, Swan takes the diastolic pressure, with the auscultatory method, to be the point at which no sound is heard over the artery. This is not the view held by most observers, although in the majority of cases the error so introduced is not great.

**THE PRACTICAL MEDICINE SERIES.** Comprising Ten Volumes of the Year's Progress in Medicine and Surgery. Under the General Editorial Charge of Charles L. Mix, A. M., M. D., Professor of Physical Diagnosis in the Northwestern University Medical School. Volume III—The Eye, Ear, Nose and Throat, Edited by Casey A. Wood, C. M., M. D., D. C. L., Albert H. Andrews, M. D., and William L. Ballenger, M. D. Series, 1915. Chicago: The Year Book Publishers. Price, \$1.50.

This little volume is one of a series of ten issued at monthly intervals and covering the entire field of medicine and surgery. This series is published primarily for the general practitioner. At the same time the arrangement in several volumes enables those interested in special subjects to purchase only the parts they desire. The editors, Drs. Wood, Andrews and Ballenger, have shown a nice discrimination in the selection of topics for review. The book well epitomizes the advances in ophthalmology and otolaryngology during the year 1914.

**THERAPEUTICS OF THE CIRCULATION.** By Sir Lauder Brunton, Bt., M. D., D. Sc., LL.D. (Edin.), LL.D. (Aberd.), F. R. C. P., F. R. S., Consulting Physician to St. Bartholomew's Hospital. With Illustrations. New York: Paul B. Hoeber. 1914. Price, \$2.50.

The five lectures, comprising this book, were delivered during a visit to this country last year. One was given at New York, three (the Herter lectures) at Johns Hopkins and one at Montreal. Each lecture presents, with



some completeness, one important subject in the fields of cardio-vascular pathology or technique and is the last word, to date, in that rapidly advancing province of medicine. None of the subjects discussed finds an adequate place in any of the textbooks of physiology or heart disease, while they are nevertheless of such practical importance that an acquaintance with them is indispensable to the progressive physician. The book should be studied by every internist who finds himself unable to keep abreast with the present flood of cardiac literature in the journals.

**THE PRACTICAL MEDICINE SERIES.** Comprising Ten Volumes on the Year's Progress in Medicine and Surgery. Under the General Editorial Charge of Charles L. Mix, A. M., M. D., Professor of Physical Diagnosis in the Northwestern University Medical School; Roger T. Vaughan, Ph.B., M. D. Volume II—General Surgery. Edited by John B. Murphy, A. M., M. D., LL.D., F. R. C. S. (Eng.), F. A. C. S., Professor of Surgery in the Northwestern University, etc. etc. Series 1915. Chicago: The Year Book Publishers. 1915. Price, \$2.00.

The volume on Surgery of the Practical Medicine Series is always a welcome visitor, for the reason that it furnishes an excellent opportunity to 'run through' the past year's work in most advantageous fashion. As in the past, this volume is edited by Dr. John B. Murphy, and also as in the past, it is excellently edited, from the point of view of fullness as well as from that of critical selection. In approximately six hundred pages there is furnished a very comprehensive résumé of the better work done during the year 1914.

**LECTURES ON THE HEART.** Comprising the Herter Lectures, (Baltimore); A Harvey Lecture, (New York); and An Address to the Faculty of Medicine at McGill University, (Montreal). By Thomas Lewis, M. D., F. R. C. P., D. Sc., Physician City of London Hospital, etc. etc. New York: Paul B. Hoeber. 1915. Price, \$2.00.

The many readers who derived pleasure and profit from the original issue of Sir Lauder Brunton's book, ten years ago, will welcome this, the second edition. It differs in several respects from the first. Less a series of informal lectures, it aims rather more at the completeness of a textbook, though even here with reservations. The pathologic anatomy and the diagnosis of cardiac disease are barely touched upon, whereas the normal pathologic physiology of the organ and the pharmacology of cardiac drugs receive much attention. Like its predecessor, it will be valued rather as containing the views of a keen observer of vast experience, than as an encyclopedic book of reference.

**THE TREATMENT OF FRACTURES.** With Notes Upon a Few Common Dislocations. By Charles Locke Scudder, M. D., Surgeon to the Massachusetts General Hospital, etc. etc. Eighth Edition, Revised, With 1057 Illustrations. Philadelphia: W. B. Saunders Company. 1915. Price, \$7.50.

The appearance of every new edition of Scudder's treatise on fractures always emphasizes the fact that it lacks almost every attribute that goes to make a classic of a somewhat similar volume by Stimson. On the other hand, again in contrast with Stimson's work, it possesses practically every attribute that makes it an essential volume to the man who has to treat fractures. Eminently practical, concise, clear in both direction and caution and admirably well illustrated, it furnishes almost all that could be offered by a volume covering this field.

Scudder has introduced some new illustrations, has added new material upon fractures of the jaw, acetabulum, upper end of the humerus, and lower end of the femur.

**PALOTAY'S CHEMISTRY CHART.** Compiled from Standard Text-Books—as a Condensed Reference Guide—for the Use of Schools, Student, Teachers, Physicians and Nurses, etc., by Dr. Jul. A. Palotay, Los Angeles, California.

This handy chart is intended to be hung up in the laboratory for ready reference. One side is devoted to the various elements, their atonic weight and other characteristics being displayed in tabular form. On the other side is a great variety of data useful chiefly to the physician or medical student and comprising a variety of definitions, fundamental physiological and chemical data, treatment of poisoning, hydrotherapeutic technique, etc. The basis of selection is not quite clear, but there can be no question that many of the

data for which one has to consult a variety of textbooks will be found on this chart.

**DIE ZUCKERKRANKHEIT (Diabetes Mellitus).** Ihre Ursachen, Wesen und Bekämpfung. Gemeinverständlich dargestellt von Dr. med. A. Sopp, Spezialarzt fuer Magen-, Darm- und Zuckerkrankhe zu Frankfurt am Main. Zweite, verbesserte und erweiterte Auflage. Wuerzburg: Verlag von Curt Kabitzsch. 1914. Price, 1.80 m.

There will probably always be a difference of opinion among physicians as to the advisability of putting into the hands of a patient a more or less detailed discussion of his disease in the form of a medical treatise minus most of the usual technicalities. To those who take an affirmative view on this question, the little book by Sopp will make a particular appeal. Its aim is to secure a more intelligent cooperation between the diabetic patient and his physician, and presupposes a fair degree of intelligence and an appreciation of the scientific point of view on the part of the patient.

**THE MEDICAL CLINICS OF CHICAGO.** July, 1915. Volume 1, Number 1. Published Bi-Monthly. Philadelphia: W. B. Saunders Co. Price per year: Paper, \$8.00, Cloth, \$12.00.

"The Medical Clinics of Chicago" follows the same model as some of the well-known surgical clinics and should prove equally valuable. The reader is in nearly the same situation as though he were seated in an amphitheatre hearing some famous clinician describe and discuss an interesting case. The actual view of patient, specimens and x-ray plates is replaced by adequate illustrations, though the latter might have advantageously been more numerous. The large number of subjects discussed, 20 in this issue, precludes a detailed review, but if the subsequent issues are as interesting as this first one, the series will be well worth having.

**WAR SURGERY.** By Edmond Delorme, Médecin Inspecteur Général de l'Armée, etc. etc. Translated by H. de Méric, Surgeon to In-Patients, French Hospital, London. New York: Paul B. Hoeber. 1915. Price, \$1.50.

We have already commented in these columns on this little treatise in the original French. The translation is excellently done, yet one cannot avoid speculating on these times out of joint, when a small monograph on urgent war surgery is immediately made available to all readers, by an early translation.

In lieu of repeating the commendatory criticism that we accorded the original volume, we shall merely say that the American medical men, who are leaving home shores for service in foreign base hospitals, will do well to pack this monograph by Delorme with their other regimentals.

**URGENT SYMPTOMS IN MEDICAL PRACTICE.** By Robert Saundby, M. D. Edin., Lieutenant-Colonel, R. A. M. C. (T.), Hon. LL.D. St. Andrews and McGill; Hon. M.Sc. Birmingham, etc. etc. New York: Longmans, Green and Company. 1915. Price, \$2.10.

The value of a book like this by Col. Saundby is doubtful, to say the least. The various symptoms from abdominal pain to yawning are discussed in alphabetical order. One can imagine the recent graduate, confronted by a case he cannot make out, running to a book like this and looking up the various symptoms his patient presents. His search will hardly be fruitful and cannot replace the careful collection and analysis of all the obtainable data.

**LES SECRETIONS INTERNES.** Principes Physiologiques Applications a la Pathologie. Par Le Dr. E. Gley, Professeur au Collège de France, Membre de L'Académie de Médecine. Paris: Librairie J. B. Baillière et Fils. 1914. 1 fr. 50.

In each one of the little volumes of the series, "Les Actualités Médicales," of which this is a member, the attempt is made to present some one medical topic as completely as is possible with great conciseness. In "Les Sécrétions Internes," Gley has not only met these conditions successfully, but has presented the subject in an eminently interesting and entertaining manner.

**SERO-DIAGNOSTIC DE LA SYPHILIS.** Par Le Prof. Hideyo Noguchi, De L'Institut Rockefeller (New York). Extraits de la 3e Edition, Traduits de L'Anglais. Par Le Dr. A. Girauld, Sous-Chef du Laboratoire d'Hygiène de la Ville de Paris, etc. Paris: Masson et Cie, Editeurs. 1914. Price, 1 fr. 50.

In a pamphlet of some 40 pages, Girauld has translated into French, extracts from the third edition of Noguchi's "Sero-Diagnosis of Syphilis." Since the portions he has chosen are chiefly those descriptive of the technique of the various modifications of the Wassermann reaction, the booklet may well serve as a handy serologic laboratory guide.

# SUPPLEMENT

ON

## ROENTGENOLOGY

(ISSUED QUARTERLY)

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## THE SPIRIT OF THE TIMES.

One is brought face to face with the intensity of the European situation when the announcement is made that henceforth the *Archives of the Roentgen Ray* will be known as the *Archives of Radiology and Electrotherapy*. Not one of the former German collaborators' names remains upon the title page. The root word 'roentgen' is not seen in the journal excepting in some American advertisements.

While these facts may only be of passing comment to Americans, they are vitally significant of the attitude of the British *x-ray* workers. When William Conrad Roentgen repudiated recent honors from the hands of an English scientific society, an editorial in the above *Archives* stated that it was a blessing to humanity that the discoverer could not withdraw the beneficence of his invisible ray to warriors in any part of the globe.

Americans can hardly conceive that the commercial or racial strife of countries will endanger the free exchange of scientific interests. Scientific revenge is a poor weapon. The bigness of minds engaged in battling with disease does not usually lend itself to pettiness in expression. A narrowness in scientific circles does not excite sympathy; rather would a liberality of scientific thought force admiration.

One of Æsop's fables relates the acquisition of a tempting home by a third party during the altercation between two original contenders. May not the present Continental contention offer a glorious opportunity to American roentgenology? Scientific ambitions surely halt when confronted with the strife of life, and the temporary discouragement in certain quarters offers possibilities to those less strenuously engaged.

There is no doubt but that America has shown herself eminent-ly capable of carrying the roentgen standard. Her priority in significant features of roentgen progress has been established. We would only mention the first use of bismuth as an opaque salt; the first practical interrupterless transformer; the first efficient protective fluoroscopic apparatus; the first establishment of certain diagnostic facts such as Caldwell's accessory sinus work, Lange's mastoid masterpiece, Cole's direct duodenal diagnosis, Pfahler's filters, Dunham's thoracic stereoscopy, Leonard's classical kidney work, and other original roentgen efforts too numerous to classify here.

E. H. S.

## THE PACIFIC COAST ROENTGEN SOCIETY.

During the week of the American Medical Association meeting in San Francisco, the Pacific Coast Roentgen Society was organized. Dr. Albert Soiland, of Los Angeles, was elected President, with Dr. Walter Boardman, of San Francisco, as Secretary, and Dr. Ernest Austin, of San Diego, as Treasurer. The next meeting will be held in December, and during this interval the roster of charter members will be established.

This Society arranged a pleasing roentgen exhibit for the benefit of medical visitors which was very much on the order of the annual

exhibits of the American Roentgen Ray Society. In conjunction with this exhibit there was an individual display of great merit by Dr. James T. Case, of Battle Creek, Mich., and a unique mechanical display of gastric lantern slides, with accompanying diagnostic charts, by Dr. R. D. Carman, of the Mayo Clinic. It was unfortunate that these exhibits were so placed in the auditorium building that the visitors were forced to seek them out rather than to find them conveniently. The Panama-Pacific Exposition offered such glorious relaxation that none of the scientific exhibits received the notice from the visitors which their merits demanded.

The Pacific Coast Roentgen Society has a good battle to fight for reliable roentgen work. As one of the Pacific coast roentgen pioneers remarked, there is an unusual amount of 'jitney' x-ray work on the coast. It seems to be the impression among many physicians there that merely the roentgen negative at the lowest price possible is the only thing necessary. They seem to be ignorant of the great fact that the interpretation of the plate is the essential factor in efficient roentgenology. A roentgenologist does not base his fees upon plate expense; his interpretation of a roentgen plate is a consultation service and demands the honorarium accorded medical consultants. Non-medical roentgen operators have their place as technical assistants to roentgenologists, but there is no excuse for the physician who accepts the interpretation of a roentgen plate from anyone who is not qualified as a medical graduate and learned in pathological roentgenology.

Therefore, it may be said, that the Pacific Coast Roentgen Society has an educational campaign ahead of it. The first officers are well qualified to inaugurate this movement of showing the physicians of the coast that only qualified medical roentgenologists can render the expert services which patients appreciate and demand.

E. H. S.

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#### SPECIAL NOTICE.

There has come to our desk the Prospectus of the interesting and highly instructive work "The Roentgen Diagnosis of Surgical Lesions of the Gastro-Intestinal Tract" by Arial W. George, M. D., and Ralph D. Leonard, M. D. (The Colonial Press, Boston), which will be published in November. As an indication of what the book will be like, the Prospectus, on account of the paper it is printed on, the letter-press and the illustrations, foreshadows much that is excellent and indicates beyond a doubt that roentgen literature will receive a most valuable asset. The authors are men in high standing in the field of roentgenology by reason of the thoroughness of their work and the assiduity with which they have always studied their cases. While roentgenologists will undoubtedly be especially interested in this publication, the general practitioner and surgeon will find in it many unusual points that will help them in arriving at correct diagnoses.

DEEP ROENTGENTHERAPY IN THE POST-OPERATIVE  
TREATMENT OF CARCINOMA OF THE BREAST.\*

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By GEORGE E. PFAHLER, M. D., of Philadelphia.

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Surgeons in general are gradually learning to recognize the value of deep roentgentherapy in the post-operative treatment of carcinoma of the breast, but very few have yet learned the value of using it in all cases. Many surgeons (Rodman, as an example) only use this treatment in more or less advanced cases, in which there is axillary or supraclavicular involvement or in which the mediastinum is suspected of involvement.<sup>1</sup> The fact that recurrences and metastases can be made to disappear leads surgeons often to operate on patients who would, under ordinary circumstances, be considered inoperable and hopeless. Most of these at least, I believe, have their lives prolonged, providing thorough post-operative deep roentgentherapy is given.

The object of this paper, however, is (1) to impress upon both the surgeon and the general practitioner the importance of using this additional force in combating carcinoma of the breast even in the earliest cases; and (2) to outline what I believe to be the most valuable technique for this post-operative treatment.

*The Danger of Recurrences Without Roentgen Treatment.*—The most enthusiastic surgeons do not claim more than 80 per cent. of cures, even in the earliest cases before glandular involvement. Many equally competent surgeons believe that this percentage is much too high, and Rodman says: "Infection of even the nearest lymphatic nodes—the axilla—permits an abiding result in only 25 per cent. of such cases."<sup>2</sup> I have seen a number of cases in which the patients were operated upon within a week after the first symptoms of any disturbance in the breast, when the tumor in the breast was barely palpable, and yet recurrence and metastasis have taken place within two months.

Rodman<sup>3</sup> maintains that surgery should cure half of all cases provided they can be subjected to complete operation early in the course of disease, but he says (p. 258) that the statistics of Johns Hopkins Hospital indicate that only 27 per cent. of patients at the time of operation were free from axillary involvement, and Halstead himself thinks that this percentage is too high. Therefore, at least three-fourths of the patients who come for operation

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\*Read before the Annual Meeting of the American Electro-Therapeutic Association at Atlantic City, September 14-17, 1915.



of carcinoma of the breast, have only a chance of cure in 25 per cent. I trust that very soon we shall be able to determine how much this percentage of cures, in the more or less advanced cases, can be raised by post-operative deep roentgentherapy, but I believe that the chance of ultimate recovery is at least doubled. Therefore, if the surgeon can save 25 per cent. and the roentgenologists 25 per cent., every argument in favor of operation must also be an argument in favor of post-operative roentgen treatment. Everyone has seen patients in whom the disease developed around the stitch holes, in the line of the incision, and in the region of subcutaneous dissection. Rodman says (p. 257): "If local recurrence takes place then it is presumable that cancer cells are left behind at the time of operation." I think the development of the disease in the stitch holes and in the area of dissection argues in favor of transplantation. This is the strongest sort of argument in favor of immediate post-operative treatment in the open wound, as is frequently carried out by my colleague Prof. Rodman and myself, but which I believe was originally done by Foerster, of Milwaukee, who first spoke to me of his results and who has recently written to me that his oldest case has remained well now seven years.

The first case treated by myself was in association with Prof. Laplace in a patient who was operated upon for a recurrence of carcinoma of the breast, and who has remained well now two years and six months to the present date.

With reference to the post-operative treatment in the open wound, Rodman says: "Since March, 1913, at least three patients operated upon were so advanced that the roentgen rays were sent into the wounds in great concentration before they were sutured, as no hope of a radical cure was entertained in any of them. One, with a very large sarcoma, died in six months; one, a case of Paget's disease, with one of the very worst axillas I have ever encountered, showed a recurrence in the neck in thirteen months. The third patient to receive roentgen rays into the wound before suturing is apparently well in every way fifteen months after operation. She was also examined this month by a number of visiting surgeons and myself."<sup>4</sup> Theilhaber also says: "The probability of success is greater when the rays are applied through an open wound."<sup>5</sup> Werner (who has had considerable experience with post-operative treatment) says: "Roentgen exposures are liable to ward off recurrences when applied after operation, especially when the rays can be applied to the open wound. He also says many cases of failure can be ascribed to inadequate dosage."<sup>6</sup>

*Argument in Favor of Immediate Post-Operative Treatment in All Cases.*—Since recurrence is likely to take place in 61 per cent. of the general run of cases as they appear for operation, of which only 27 per cent. are free from axillary involvement, estimated

on the basis of recurrence in 20 per cent. of the very early cases, and a recurrence in 75 per cent. of those with glandular metastasis, it is surely our duty to leave no means unused that will give the 61 per cent. some chance of permanent recovery. The object of this post-operative treatment is first to cause the atrophy or destruction of outlying cells or glands that have not been reached by the surgeons, or the destruction of cells that have been transplanted into the wound; and second, to cause the obliteration of the lymphatic channels, which would otherwise permit dissemination of the disease. Therefore, the sooner these cells are destroyed or rendered inactive by the rays, the less likelihood will there be of multiplication and further development. This, in itself, forms a strong argument in favor of treatment upon the open wound before suturing, and while the patient is still under ether. As proof that the rays have a destructive effect upon the carcinoma cells and beneficial effect upon the patient suffering from carcinoma, I need only refer to my own papers on the treatment of "Inoperable Primary Carcinoma of the Breast,"<sup>7</sup> and "The Treatment of Recurrences and Metastasis from Carcinoma of the Breast,"<sup>8</sup> and the "Roentgen Rays in the Treatment of Deep-Seated Malignant Disease,"<sup>9</sup> and to the very excellent results obtained by Boggs in the "Roentgen Treatment of Carcinoma of the Breast,"<sup>10</sup> in which he made a report on "twenty unfavorable cases for operation, classed as inoperable because there was extensive involvement of both axilla and supraclavicular lymphatics together with a broken down mass or about to break down." He says while there are only five of these twenty patients living to-day, every one of them was sufficiently benefited to justify the treatment. The pain was relieved for a period averaging a year; in nearly every case the mass was reduced in size and in some cases it became freely movable. Almost every one of these patients was able to perform her usual duties and be with her family, free from pain and from the offensive odor so distressing in ulcerated carcinoma. The patients who died from internal metastasis did so without external symptoms except swelling of the arm.

It is not always practical to give treatment into the open wound while the patient is still under ether. In such instances, the treatment should be given as soon after the operation as the patient can be safely moved into the roentgen treatment room. When, for any reason, post-operative roentgen treatment cannot be given, then treatment should be applied at the earliest sign of recurrence, for a considerable number of these cases with recurrences and metastases can be got well, as I have previously shown.<sup>11</sup> Unfortunately, most of these inoperable and advanced cases will die sooner or later of the disease, and the friends and relatives who do not know of the advanced state of the disease are apt to ascribe death to

the failure of the rays, and sometimes they even believe the rays caused the death or even caused the disease. It then has exactly the same effect described by Gibbon,<sup>12</sup> who believes it unwise to operate on advanced cases of malignant disease because friends and relatives do not realize that the operation was undertaken with the hope of giving comfort and prolongation of life to the patient, and therefore they conclude that it is a failure of surgery. This, he says, leads other curable patients to avoid operation. So too with the roentgen rays, unsuccessful results in these advanced cases lead some other patient, who could be cured, to avoid the treatment. Roentgenologists are sometimes placed in an unfair position by surgeons who will not acknowledge the failure of their operation, and refer the patient for 'rheumatism' in the shoulder and arm or 'neuritis,' and then caution the roentgenologist that he must not tell the patient or the friends what is the real condition. Naturally the patient and the friends conclude that the roentgen rays caused the recurrence. This is manifestly unfair, and roentgenologists, for the sake of the good of other patients, should not assume this responsibility, and should not permit such practice to continue.

In the inoperable cases, whether it be from refusal, advanced disease, or some complicating disease, the patient should be at once referred for roentgen treatment, for even in these advanced cases, some can be got well, and all can be made more comfortable, as I have also proved in a previous paper.<sup>13</sup> Boggs,<sup>14</sup> reminds us that this treatment should be skillfully applied, and says: "Inadequate treatment is not only useless, but I believe, small doses stimulate growth of tissue, while efficient radiation retards and destroys new growths."

All roentgenologists and most surgeons are recognizing the value of this post-operative roentgen treatment in the more or less advanced cases, but few seem to realize the importance of this post-operative treatment in cases in which there is no glandular involvement. The best evidence yet produced of the value in these earlier cases is that by Dachtler.<sup>15</sup> As a result of his visits to leading hospitals eight years ago to determine the value of post-operative treatment, he says: "I found that whenever unfavorable opinions were given, almost invariably on investigation faulty methods in technique were discovered. As a rule there was not a hearty co-operation between the surgeon and the roentgenologist, the roentgenologist stating that usually only a short series of treatments was given while the patients were in the hospital. After returning home they either did not come for treatment or they returned at irregular periods. On the other hand, in some places where the surgeon would have given the method a fair trial, the facilities for roentgen treatment were sadly inefficient. In some hospitals



the work was in charge of internes, who often had not mastered the first principles of roentgentherapy. In other places the protection offered the *x*-ray operators was so meagre that they could not be expected to push the work under conditions which meant grave danger to themselves. In one celebrated institution of learning patients were sent to the *x*-ray department (which was in charge of inexperienced internes) with a prescription calling for so many minutes of *x*-ray treatment. Absolutely no method for measurement of dosage was known or attempted. In one large charity hospital, where many cancer patients were treated, post-operative *x*-ray treatments were given only while the patients remained in the hospital." Unfortunately, the above criticisms, referring to conditions eight years ago, will apply in many instances to-day.

In Dachtler's work during the past eight years, he was able to obtain the complete co-operation of the surgeons, and bases his report on private cases only in which the subsequent history could be followed, and only treated such cases as would promise to continue the treatment long enough to produce results. All the cases were carefully diagnosed, and in all cases the surgeon reported as to the presence or absence of axillary involvement. He says of the 16 cases showing no axillary glandular involvement at operation, 13, or 81 per cent., are alive and well, after five years. Excluding again the doubtful cases that died before the five-year period that had elapsed, but *who were found at autopsy to be free from cancerous disease, the percentage of cures reaches 100 per cent.* This is a gain of at least 20 per cent. over the best records ever produced by surgery alone.

While the number of cases treated by Dachtler is not great, 100 per cent. of cures of cancer is so unusual as to prove the strongest sort of argument for post-operative treatment in all cases instead of limiting it only to the inoperable or advanced cases which are operated upon only because it is hoped that the rays will eliminate the disease that the surgeon cannot remove. Dachtler believes that the immediate use of the ray on the operating table, or leaving the wound open for treatment before closure, is not necessary, because, according to him, the chief effects of post-operative roentgentherapy are the obliteration of the remaining lymphatics and lymphatic glands. In his experience the *x*-ray treatment has entirely eliminated skin recurrences after the radical operation for cancer of the breast in all cases.

The present view of surgeons in general was, I think, fairly well expressed by Rodman<sup>16</sup> recently in Murphy's "Clinics," in which he said: "If the operation is performed before there is involvement of the axilla, 80 per cent. and upward will be permanently cured. If there is involvement of the axillary lymphatic glands, which may occur at almost any time, but may be confidently expected within a

year, the percentage of cures will not exceed 35 to 40 per cent., and not that much unless the operation is followed by a thorough course of x-ray treatment.

"Fourth: We have, during the past five years, witnessed such excellent results, apparently from the use of the x-rays in advanced cases that we are now inclined to use them routinely in both average and advanced cases. In early cases their use would appear to be a work of supererogation.

"Fifth: In the most advanced cases we prefer to treat the wound by a full dose of the rays before it is sutured. We have not found the time lost in so doing either harmful to the patient or to interfere in any way with primary healing of the wound, as the roentgen laboratory is near my operating room."

As evidence of the importance of thorough treatment even in cases in which there is no microscopical evidence of glandular metastasis, I need only quote from Judd:<sup>17</sup> "In 1906 we operated on two patients in whom there was a very small lesion in the breast, and no glandular involvement could be found. Macroscopically and microscopically the diagnosis was early carcinoma, and we believed both were favorable cases. Both of these patients had early metastases, and one died within two years. These two patients seem to illustrate a certain group who, in all probability, at the time of the operation, have internal metastases or extension to the mediastinal glands without evidences of such extension. We have seen several hopeless cases because of metastases to the liver, spine or bones, and yet in which the primary focus was small and free, and no enlarged glands could be felt."

And, as proof of the limiting effects of the rays on this disease, another case reported by Judd from the Mayo Clinic was a patient whose breast had been removed elsewhere four years previously. Some weeks after this operation she developed nodules in the axilla. *These were treated by x-rays for a period of some months.* The recurrent masses were then removed at the Mayo Clinic and the patient was living six and a half years without further evidence of cancer.

*Modern Technique.\**—Most treatment with the roentgen rays, both in primary, recurrent and metastatic carcinoma in the past has been given by the fractional dose method. This same technique was used in the post-operative treatment, and it is rather remarkable that the results from this treatment have been so good. In the days of fractional dose methods, one application after another was made upon the same area of skin, which, if of sufficient quantity, was apt to bring about a dermatitis and to produce only sufficient deep effect to cause stimulation. During the past few

\*This technique was described by me at the midwinter meeting of the Eastern Roentgenologists at Atlantic City, January, 1915.

years there has been gradually evolved what is to-day known as the technique of deep roentgentherapy. Most that has been written, however, under this title, applies to the treatment of gynecological conditions.

With the idea of cross-firing upon the disease in the chest and



Fig. 1.—Showing the usual division of areas for post-operative treatment of carcinoma of the breast anteriorly. The rays are directed toward the axilla, supraclavicular regions and the mediastinum.



Fig. 2.—Showing the usual areas posteriorly through which treatment is given.



axilla following carcinoma, I have, for many years, directed the treatment through the anterior, lateral, posterior and supraclavicular aspects of the chest, but during the past two years I have definitely outlined the areas of skin through which I give the treatment, so that every portion of the skin receives a definite full dose so placed that the greatest amount of cross-firing will occur in the axilla and supraclavicular regions which are the usual lines of extension of carcinoma of the breast.

*Division of Areas.*—In order to prevent recurrences in the wound, I divide the lower portion of the incision comprising the mammary region into one or two areas, depending upon the length of the incision (Figs. 1 and 2). Joining to this then are three triangular areas radiating from the shoulder and lying between the clavicle and the axilla. A dose is then sent directly through the axilla; another dose through the posterior fold of the axilla. The space between the clavicle and the spine of the scapula is divided into two triangular areas, and a full dose is given through each of these. Then one or two doses are given between the scapula and the spinal column directed toward the mediastinum and toward the mammary region. If there is suspicion of mediastinal involvement, the rays are sent in addition through from four to six different areas toward the mediastinum. In general, for the average post-operative case, treatment is given through from six to twelve different fields, the number being limited so far as seems safe, so as to keep down expense, for this treatment at best is expensive, and the expense is approximately the same to give a full dose through one area, whether it be small or large, and this expense is multiplied by the number of such doses that is necessary to be given. By this process of multiplying doses, the rays are made to cross from three to six times through the axilla and from two to four times through the supraclavicular region, and most of the doses reach the mediastinum to a greater or lesser degree.

*Interval Between Treatments.*—All the above doses are given in one series, generally on one day without interruption, but at times it is more practical to use two days to give a series. I generally repeat this series of treatment at the end of three weeks, and again at the end of four weeks. Generally from three to six such series are given. The number will, of course, depend upon the degree of malignancy and the extent of the disease preceding operation. I believe that in many instances failures have been due to inefficient or insufficient treatment. During the interval between the series the patients can go about their usual affairs—at least, so far as the roentgen treatment is concerned, and when coming from a distance (unless it be too great) can return to their homes. In cases of advanced disease, one should not set a definite number of series, but should simply increase the interval so much

as seems practical until one can feel reasonably certain that the patient will remain well. In this the close co-operation of the attending physician is needed to prevent the patient from growing careless.

*The Dose.*—The dose refers to the amount of treatment given through each particular area of skin, and is limited by the skin toleration. I find that I can give twice the pastille dose as measured by the Sabouraud and Noire pastilles, providing the rays are passed through 3 millimetres of aluminum and one layer of sole leather before reaching either the skin or the pastille. It must be borne in mind that these pastilles have been made to be used midway between the target of the tube and the skin of the patient. After one has standardized their technique the dose can be fairly well measured by noting the time, distance of the anode from the skin, the amount of milliamperage and the length of the parallel spark gap. These elements will vary considerably with each equipment. This technique, however, should be controlled from time to time, and can easily be done by laying one of these pastilles on the skin protected from daylight and using the same pastille on two different areas which should then be changed to the deep orange tint "B," which records a value four times as great as when placed midway between the anode and the skin. Working with a Coolidge tube, 25 milliamperè-minutes with a transformer current, with a parallel spark gap of 9" and the target 8" from the skin, will give double tint "B," or the usual dose that I give. If this distance is changed, it must be remembered that the quantity of rays will vary inversely with the square of the distance. Over areas where recurrence has already taken place, I sometimes use a dose equal to three times tint "B" or the equivalent of 30-x. When care is used, the photographic method of measurement recommended by Koenbäch and adapted by myself<sup>18</sup> may be employed, when the dose is recorded in X-Tint "B" 10-x.

*Filters and Protection.*—At present I am using uniformly three millimetres of aluminum over one layer of sole leather for this work. In giving these multiple doses, the rays, of course, must be confined to the area treated. The hair must be carefully protected by sheets of lead or by the opaque rubber, and the rays should be confined about the tube so as to limit vagrant rays so far as is possible.

*Time of Beginning Treatment.*—When practical it is desirable to give the treatment through the open wound just as the surgeon finishes his operation and before suturing. The layers of skin are drawn back so far as is practical; the hemastatic forceps are removed, and the whole area is covered with several areas of sterile gauze or a sterile towel. The patient, while under ether, is then turned over so as to lie on the healthy side; the arm is

either drawn upward or thrown well forward, and a similar quantity of rays is sent directly into the axilla. When all is in readiness beforehand (as it should be), this manœuvre and treatment with our modern equipments should not require over twenty minutes from the time the surgeon removes the clamps to the time he is ready to put in his sutures. We have not found that this jeopardized the success of the operation nor that it has interfered with the healing of the wound. At the end of a week or two the patient should then receive the regular post-operative treatment as outlined above.

When it is not practical to treat the patient through the open wound, the regular post-operative treatment should be given just as soon after the operation as the condition of the patient will permit moving to the roentgen treatment room, which is usually in from a few days to two weeks. Even when the patients must be moved from the hospital in which they are operated upon to some other place for treatment, it can easily be done within two weeks. It is a mistake to consider roentgen treatment as post-operative when it is first started after the patient begins to have some indurations of the tissues, some shooting pains, or other signs of recurrence.

*Treatment of the Ovaries.*—Theilhaber says:<sup>19</sup> "The genital glands act apparently favorable on the development of cancer, their influence being 'cancrigenous' while the blood-forming organs possess 'cancrilytic' action. Therefore, I attempt to produce an atrophy of the sexual glands by roentgen treatment in women who are still menstruating. Recurrences after the breast amputation is more readily prevented if the ovaries are destroyed, the clinical experience which different operators had had with castration in inoperable carcinoma coinciding with this fact." In this treatment of the ovaries for the effect on the breast, I have had no experience, but it seems to me to be worthy of trial, and I hope to have the opportunity soon of testing it.

Lett<sup>20</sup> has done the operation or oöphorectomy in inoperable mammary cancer in 99 cases, and his conclusions were as follow:—

1. There was a very marked improvement in 23.2 per cent., and distinct, though less marked, improvement in 13 other cases; that is, 36.4 per cent. of all cases operated upon were materially benefited by the operation. If the patients who were more than fifty years old are omitted, of the remaining 75 cases, 29.3 per cent. showed very marked improvement, and 9 others showed distinct improvement; that is 41.3 per cent. were benefited by the operation.

2. In successful cases the benefit has been great, and is mainly shown in relief from pain, marked improvement in health, diminu-



tion or even disappearance of the growth, healing of ulcers, and prolongation of life.

3. The duration of the improvement is not very often stated, but in 15 cases the improved condition was maintained for more than twelve months, and four other patients had good health for four and a half years or more.

4. Oöphorectomy does not cure the disease, for in all the cases in which the growth has disappeared after the operation it has subsequently reappeared; locally or elsewhere, with the exception of one patient, who is alive and free from recognizable cancer at the present time, five years after oöphorectomy.

5. The most favorable age for operation is from forty-five to fifty; in relatively young patients it should be given a further trial, but after fifty it is rarely worth doing. The fact that the patient has passed the menopause does not contraindicate the operation.

6. Thyroid extract is not a necessary factor in the treatment, although the results have been slightly better when it has been given.

7. Secondary growths in the viscera contraindicate the operation; rapidity of growth, or an early recurrence after the primary operation, makes the prognosis unfavorable.

8. The mortality in this series of cases is high—a little over 6 per cent. It should be noted, however, that the actual cause of death in several of these cases may be regarded as accidental; in two the fatal issue was due to pulmonary embolism and in one to acute mania.

Since the same effects on the ovaries can be accomplished by roentgentherapy, an operation which has a fatality of 6 per cent. should be avoided, yet since Lett's results seem to indicate a distinct improvement and since this treatment upon the ovaries can be so easily given, it would be wise to add this ovarian treatment in cases in which the ovaries are still active.

*Constitutional Effects of the Treatment.*—In most patients there are no constitutional effects following the treatment, but since we are giving this massive dose treatment, multiplying the doses, some patients develop nausea and occasionally vomiting, and at times a certain amount of prostration which continues from one to three days. I believe that it is due to the gases which are generated by the action of the high tension currents on the air. On this account every possible means should be used to keep the air of the room as fresh and pure as possible. This can be done by means of a suction apparatus arranged around the tube as originally suggested by Caldwell, and by the use of fans (Pfahler: The Cause and the Elimination of the Constitutional Symptoms Associated with Massive Doses of Deep Roentgentherapy.—Ref. Proceedings

of the American Roentgen Ray Society, September, 1915), which will enable one to direct the currents of air so that the gases will be carried away from the patient. A hypersensitive nervous system probably also enters into this as a cause. I do not believe that it is the result of the effect of the rays on the tissues as it has been suggested by some authorities. In cases that have this tendency to a marked degree, it may be well to use two or more days in order to give a series.

#### CONCLUSIONS.

1. There is a tendency to recurrence and metastases of carcinoma of the breast in at least 20 to 25 per cent. of the cases, even with the earliest operations, and in those in which there has been glandular involvement there is a recurrence in at least 75 per cent. of the cases. Therefore, it is our duty to use every means at our command that gives promise of an increase in the number of cures.

2. Since definite recurrences and metastases, following carcinoma of the breast, can be made to disappear by means of roentgentherapy, it is reasonable to expect the disease to disappear at an earlier stage immediately after operation, when only a few isolated cells or a beginning infected gland remains.

3. Efficient and thorough treatment in the early cases will probably increase the percentage of ultimate recovery from 75 to nearly 100 per cent.

4. Thorough massive dose treatment by cross-firing methods may be expected to accomplish more than has been previously accomplished by the older methods.

5. Patients should be kept under observation for several years, and at the earliest sign of recurrence they should be subjected to a thorough course of deep roentgentherapy.

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## ROENTGENOLOGY OF THE ACCESSORY NASAL SINUSES WITH SPECIAL REFERENCE TO SINUSITIS IN CHILDREN.

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The roentgenogram has become an invaluable aid in the diagnosis and treatment of accessory nasal sinus disease. That its use is not more universal is to be regretted, for the anatomical and pathological information derived therefrom cannot be gainsaid. With an unvarying technique a fairly exact interpretation of the plate may be made. More than one thousand roentgen examinations of the sinuses have been made at the Johns Hopkins Hospital during the past fifteen months. The postero-anterior position has been used as modified by Dr. Chas. A. Waters of the Department of Actinography. He describes the technique as follows: "An important factor in making roentgenograms of the nasal sinuses is being exact in each individual case, and intimately associating oneself with the style of head with which one is dealing. . . . We have classified two distinct types—namely, the concave and the convex face; and there is a difference of an angle of only two degrees in the entire technique. . . . Only three points are essential in order to obtain roentgenograms of this region as described: First, the chin should always touch the plate; second, the long axis of the tube should be parallel to the plate; third, the nose of the patient should be from 1 cm. to 1.5 cm. from the plate. Under this rule, the importance of knowing which style of head one is dealing with is obvious. For instance, in the convex-shaped face, the nose is 1 cm. from the plate, whereas in the concave-shaped face the distance should be increased by about  $\frac{1}{2}$  cm."<sup>1</sup>

By this technique, the shadows of the petrous portions of the temporal bones are projected beneath the floors of the maxillary sinuses. This is a decided advantage in double maxillary sinusitis, especially in children. The shadows of the posterior ethmoidal cells are shown below those of the anterior group. This was demonstrated by the application of silver clips and the injection of bismuth paste.<sup>2</sup>

Some doubt was entertained in regard to the effect of the distance of the forehead from the plate upon the detail of the frontal sinuses. Careful measurements, however, showed that the dis-

tortion was but slight. There was no impairment of the definition, and orbital extensions of the frontal sinuses could be more easily determined. This position is shown in Fig. 1. Figs. 2 and 3 show roentgenograms of normal adult sinuses.

Turner and Porter<sup>3</sup> refer to the possibility of a diseased anterior ethmoidal cell simulating an affection of the frontal sinus and state that Albrecht described a condition of the kind which he found in a cadaver. The skiagram showed indistinct hazy shadows in the frontal areas, and the frontal sinuses could not be differentiated. The ethmoidal labyrinth appeared to extend upward in an unusual degree. Dissection showed a large frontal bulla on each side, containing swollen and edematous mucous membrane with seromucous secretion and purulent discharge. The frontal sinuses were normal and of moderate size. By projecting the shadows of the anterior ethmoidal cells to a lower level than was done by the older methods, the possibility of confusing ethmoidal and frontal sinus disease is reduced.

Figs. 4 and 5 show unilateral clouding of frontal, ethmoidal and maxillary sinuses.

In the Johns Hopkins Hospital the sinus roentgenograms are consulted at subsequent examinations of the patient as well as during the course of operations upon the sinuses. This practice has been of decided benefit in the interpretation of the plates, both from the pathological and anatomical standpoints.

Before puncture and irrigation of the maxillary sinus is performed, one can determine its relative size, width, vertical position, depth of palatal recess, etc. Errors in exposure or development with the varying densities of the plates may give rise to some difficulty in their interpretation. A generalized fogging may be present, and here one may be guided by the orbital shadows as a means of comparison, their relative densities being of great service in determining whether a slightly clouded sinus may be considered the seat of inflammatory change (Fig. 3).

Finzi and Hett<sup>4</sup> have made a careful study of the roentgenology of the maxillary antrum. They state that the antrum must be transilluminated, and warn against the unfortunate tendency among medical men to think that transillumination and the *x*-ray can be used as substitutes for each other. Excellent tables are given comparing the *x*-ray findings with those of transillumination in the various pathological conditions of the maxillary sinus. They have prevented the obscuring of the maxillary sinuses by the petrous portions of the temporal bones by projecting these shadows upwards. The maxillary sinuses are well shown by their method, but unfortunately the frontal sinuses, unless quite large, are obscured by the basal structures. This would necessitate two postero-anterior roentgenograms in many cases, and from a care-

ful study of the article I do not think that their technique for maxillary sinus roentgenograms has any advantage from an anatomical or pathological standpoint over the position as modified by Dr. Waters.

What has been said regarding the merits of roentgen study of sinusitis in adults may be doubly emphasized in the case of children. As experience widens, one is convinced that sinusitis is relatively frequent in the young and is very often undiagnosed. A study of the anatomy and development of the sinuses adds confirmation to this view. Davis<sup>5</sup> gives the results of most complete and painstaking examination of sinuses from the sixtieth day of fetal life to advanced maturity. A study of the specimens and drawings makes one realize more fully the probable incidence of sinusitis in children and the difficulties of regional diagnosis by intranasal examination. These difficulties may be so great as to necessitate a general anesthetic before any definite information can be obtained.

Children may come complaining of long-standing nasal discharge uncomplicated by headaches or general symptoms. In others, headaches, more frequently frontal, may be the prominent symptom with negative eye and gastro-intestinal examinations. Careful questioning may elicit the history of a 'grippe' or severe cold followed by a persistent nasal discharge or expectoration, frequent but small in amount. Again a child is brought on account of a cough and expectoration. Examinations of the chest and sputum are negative, and one must look for another source of the trouble. On account of the frequency with which certain gastro-intestinal conditions in adults clear up, following the eradication of a chronic sinus infection, one may with certainty ascribe some similar conditions in children to the same cause.

Asthma is another condition which demands a careful examination of the sinuses, even in the absence subjectively of nasal obstruction or discharge. Chronic arthritis may also be due to a chronic sinusitis, often undiagnosed and ignored. There may be frequent slight elevations of temperature in a child due to the same cause.

On suspecting a sinusitis, one is anxious to know which sinuses are affected. The intranasal examination is most difficult and frequently of little value in differentiating between ethmoidal and antrum infection. The transilluminating lamp is of questionable value, and has been aptly called a misleading toy. It is of prime importance to determine whether the maxillary sinus is the source of the chronic discharge, and should be treated by lavage or drainage, whether the frontal sinuses are affected and the anterior ends of the middle turbinates should be removed to facilitate drainage, or whether the ethmoidal cells are alone involved and inhala-



tions, irrigations, or local applications should be the form of treatment. The roentgenogram is essential in the rational treatment of these conditions. One should hesitate to puncture and irrigate a maxillary sinus in a child without the anatomical and pathological information the roentgenogram affords. It is indispensable in the diagnosis of frontal sinusitis, and the anatomical information derived therefrom is most essential on account of variations in size and position as well as the relative frequency one meets with absence of the frontal sinuses.

It must not be assumed that roentgen examinations of children are unattended by great difficulty in some cases, yet the duration of exposure has been reduced to a few seconds by the high powered transformers and tubes of recent manufacture, thus lessening the probability of the patient moving.

Figs. 6 and 7 show normal sinuses in children.

Fig. 9 shows double maxillary infection, while Fig. 10 shows a polysinusitis on one side. Fig. 11 shows involvement of the left maxillary by a tumor. Figs. 12 and 13 show inequality of the maxillary sinuses.

There is much yet to be learned of chronic sinusitis in children and its effect upon the general health and growth of the child. Close co-operation between the pediatrician and the rhinologist will accomplish much, and roentgen examinations will play no little part in the diagnosis of the nasal conditions.

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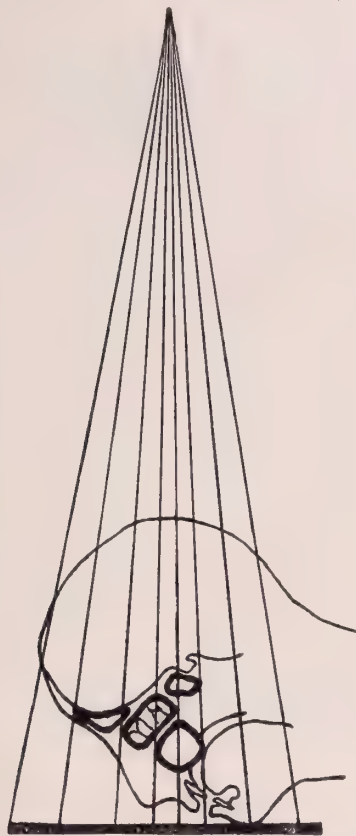


Fig. 1.—Diagram showing the modification of the postero-anterior position and the projection of the rays upon the plate.



Fig. 2.—Normal adult sinuses, taken by the modified postero-anterior position. The sinuses are well developed.



Fig. 3.—Normal adult sinuses. The ethmoidal cells are well shown. The patient's nose was a little too near the plate, causing the shadows of the petrous portions of the temporal bones to be projected across the lower portions of the maxillary sinuses.

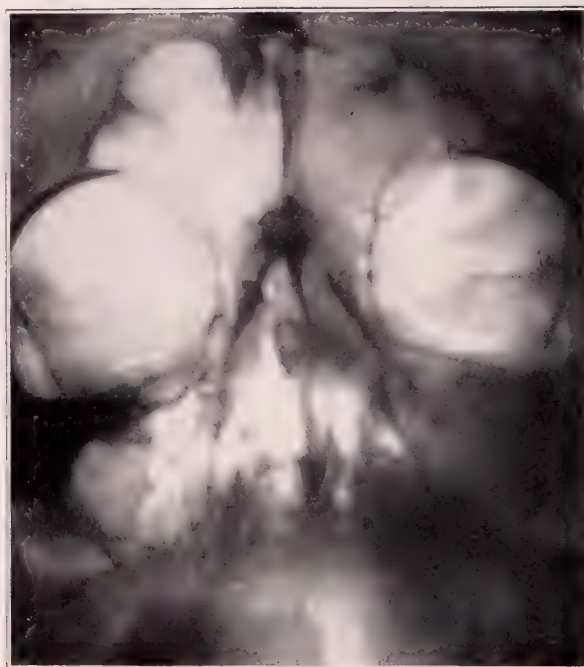


Fig. 4.—Chronic suppuration of the right frontal, ethmoidal and maxillary sinuses.



Fig. 5.—Chronic suppuration of the right frontal, ethmoidal and maxillary sinuses.



Fig. 6.—Normal sinuses (child, *æt.* eight). The ethmoidal cells are well developed; the frontal poorly. There is slight clouding of the left maxillary sinus.



Fig. 7.—Normal sinuses (child, *æt.* six). The was a more or less constant nasal discharge with repeated nasal colds. The removal of a large mass of adenoids followed by nasal irrigation resulted in a clearing up of the condition.



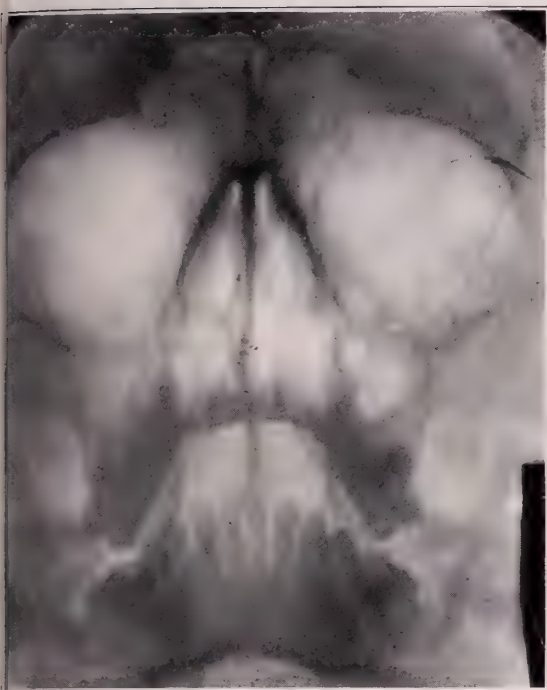


Fig. 8.—Chronic suppuration of both frontal sinuses, the ethmoids and left maxillary sinus (child, *æt.* eleven). Following an acute nasal cold, her forehead became swollen. Under ether, the anterior ends of both middle turbinates were removed and the anterior ethmoidal cells well opened. The swelling rapidly subsided and a rhinorrhoea could be felt in the anterior wall of the left frontal sinus.

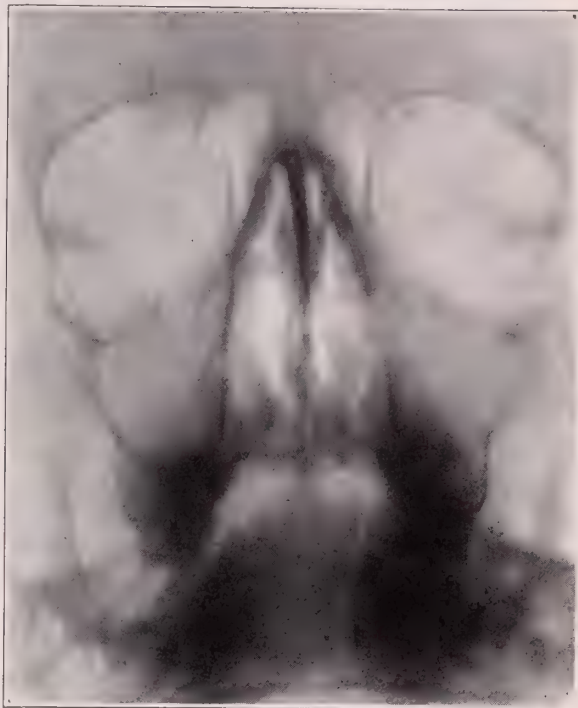


Fig. 9.—Chronic suppuration of both maxillary sinuses (child, *æt.* ten). There was marked nasal discharge without headaches or other general symptoms.



Fig. 10.—Infection of the left frontal, ethmoidal and maxillary sinuses (child, *æt.* nine). He had complete obstruction of the left side of the nose by large polypi, with but slight discharge.



Fig. 11.—Polypoid tumor of the left side of the nose and of the left maxillary sinus (child, *æt.* nine). The tumor was probably a sarcoma, but the refusal of the parents to permit the removal of a small portion for microscopical examination prevented an exact diagnosis.

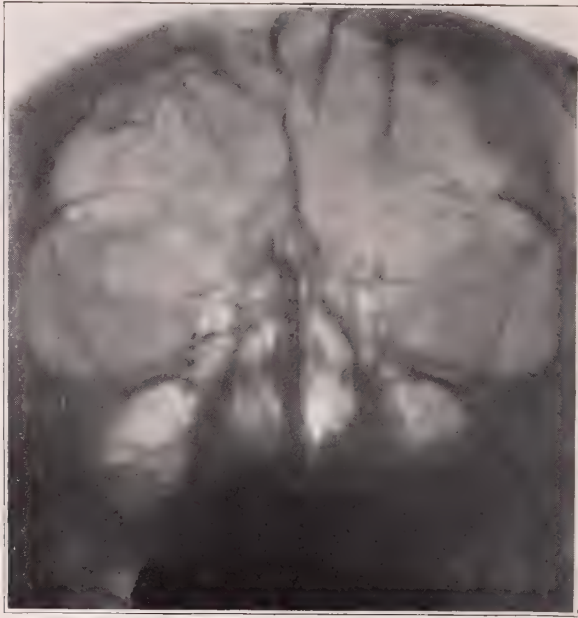


Fig. 12.—Adult sinuses. The frontal sinuses are very large with septa and orbital extensions. The ethmoidal cells are well-developed and there is an ethmoidal cell in the crista galli. The maxillary sinuses are unequal and are obscured by the shadows of the petrous portions of the temporal bones, due to faulty position.



Fig. 13.—Adult sinuses, showing marked inequality in size of the maxillary sinuses. This condition is met more frequently than has been supposed and accounts for some of the variations in the transillumination of normal maxillary sinuses.

## THE ROENTGENOGRAM AS AN AID IN FRACTURE WORK.

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The great essential in the treatment of fractures is a definite understanding of the nature and extent of the trauma.

Until the introduction of the roentgen ray as an aid to diagnosis, we were compelled to rely on physical signs of a more or less indefinite character.

The degree of swelling due to extravasation, the nature of the deformity as evidenced by shortening, or deviations from the normal line, disability, pain, and evoked crepitus,—all contributed to the symptom-complex which justified us in the assumption of the presence of a fracture.

The diagnosis of fracture made, we were still more or less in the dark as to its exact location, the extent of comminution, if present, the degree and direction of overriding of fragments, as to whether the line of fracture was transverse, oblique, or spiral.

Notably in the case of fractures in the vicinity of joints we were at a loss to estimate correctly, or even approximately, the extent of joint involvement. Nowhere was this uncertainty more in evidence than in the well-remembered controversies as to whether certain fractures at the hip were intra- or extra-capsular.

The popular belief that a bad sprain is worse than a break, has its justification in the frequency of the fracture-sprain as shown in *x-ray* findings.

A fractured scaphoid or dislocated semilunar will not infrequently explain disability at the wrist, and a fractured or dislocated astragalus account for permanent lameness at the ankle (Figs. 1, 2, 3 and 4).

A linear split either in the tibia, or femur, debouching into the knee-joint, if unrecognized, and the patient permitted to get about too soon, may result in the formation of spurs which will ultimately disable the joint. (Fig. 5).

Fractures or avulsion of the tibial spines could hardly be determined even inferentially, had we not had the *x-ray* to show us the possibility of such an occurrence.

The extent of damage revealed by the *x-ray* in certain fractures, especially in the vicinity of joints, would be appalling, were it not for the fact that experience has shown that results of treat-



ment are often vastly more favorable than the *x-ray* picture would encourage us to hope.

I feel confident that many of the older surgeons, who got fairly good functional results in certain classes of fractures, would have despaired of getting anything but complete disability, could they have been confronted with skiagrams of these cases at the time of injury.

One of the unfortunate by-products of skiagraphy in fracture work, has been an excess of zeal for operative interference as a result in part of undue apprehension of disabilities consequent on conservative treatment.

In fractures through the diaphyses of long bones, a fairly correct estimate of the nature and extent of the fracture may be arrived at, without the aid of the ray, but in fractures in the vicinity of joints it will be better for the welfare of the patient, and the reputation of the surgeon, if the *x-ray* be called to his aid whenever available.

After a large experience with fractures, checked up by careful examination of accompanying skiagrams, one may arrive at inferential conclusions without their aid, which will be fairly accurate in a considerable proportion of cases.

Every now and then, however, pride in such acquired acumen will suffer quite a fall, and we are forced to conclude that all signs fail in fractures, as in dry weather.

If for no other reason than self-protection, we should avail ourselves of the roentgenogram when possible. An overlooked fracture may be the experience of the very elect.

I recall a fracture of the humerus through the tuberosities with absolutely no displacement, and no more localized tenderness on pressure than is often found in strain, or synovitis.

The man was obviously a malingerer in my judgment, and I nearly made the fatal mistake of dismissing him from my service without a skiagram having been taken. This, however, showed the picture in Fig. 6.

On another occasion I was enabled to make an exact diagnosis in advance of the *x-ray* findings, by means of marked pencil tenderness across the head of the tibia, as shown in Fig. 7.

It would be altogether improbable that a diagnosis of a fracture into the pelvis through the pit of the acetabulum, as an uncomplicated injury, would be made without the *x-ray*. Such a case I had the privilege of seeing in the service of my colleague, Dr. John C. Oliver.

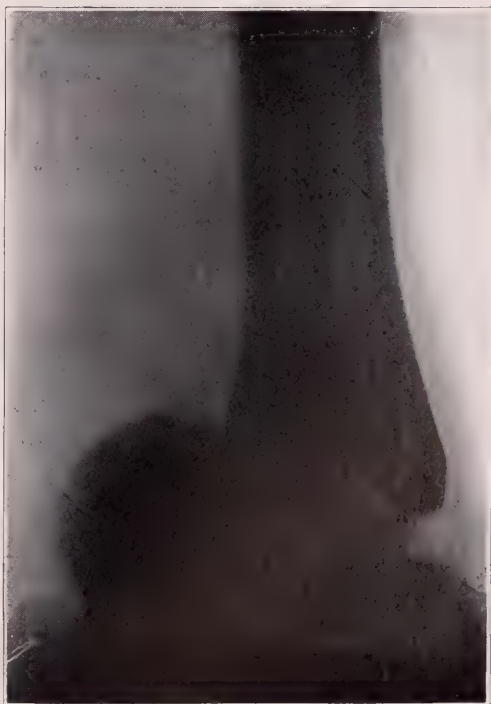
The nature and extent of fractures of the pelvic bones can only be determined by the aid of the *x-ray*. Fracture of the descending ramus of the pubis is more often than not accompanied by laceration of the membranous urethra as it passes through the



Fig. 1.—Fracture of scaphoid.



Fig. 2.—Dislocation of semilunar.



Figs. 3 and 4.—Fracture-dislocation of astragalus.



Fig. 5.—Linear fracture in tibia, debouching into knee-joint.



Fig. 6.—Impacted fracture through tuberosities of humerus. No displacement.



Fig. 7.—Transverse fracture through heads of tibia and fibula. No displacement.

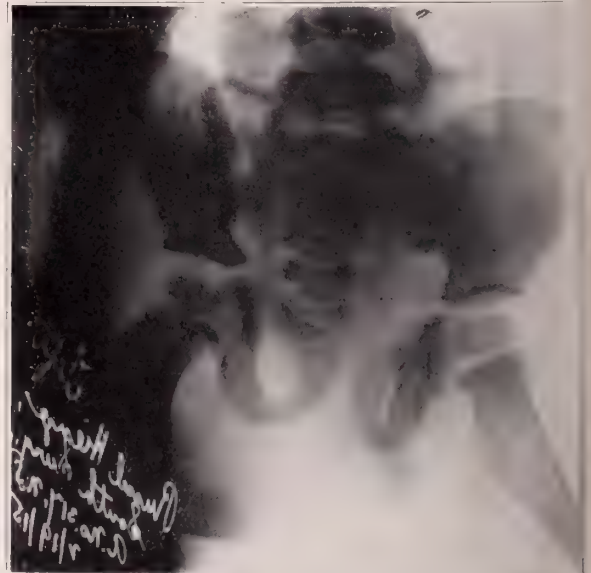


Fig. 8.—Multiple fractures of pelvis, boy, aged five. Good recovery.





Fig. 9.—Fractured elbow in same as Fig. 8.



Fig. 10.—Intertrochanteric fracture with separation of lesser trochanter, and split down the shaft.



Fig. 11.—Comminution at elbow.

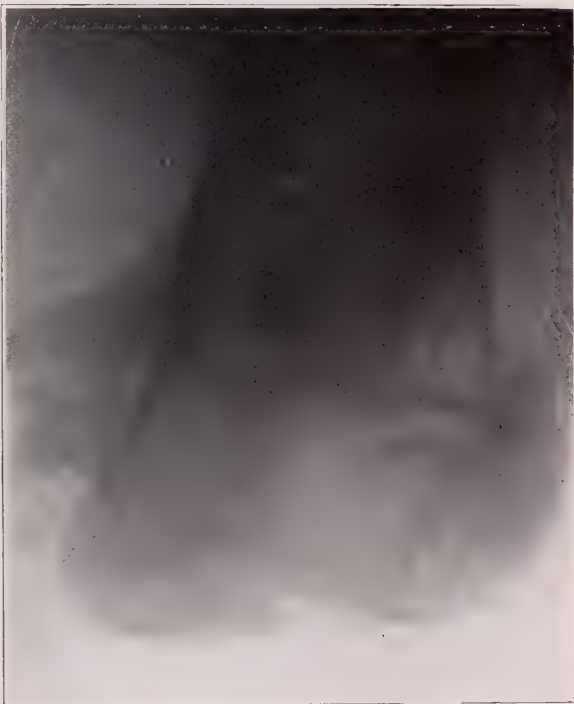


Fig. 12.—Same as Fig. 11, after moulding of fragments and flexion of forearm on arm.



Fig. 13.—Fracture-dislocation of head of humerus of irreducible type.



Fig. 14.—Fracture-dislocation of humerus. Head in axilla.



Fig. 15.—Removal of head in Fig. 14. After failure to reduce by manipulation.



Fig. 16.—Extensive comminution of tibia. Result perfect.

triangular ligament. On several occasions I have been able to locate the line of fracture by the accompanying hematuria.

Fig. 8 shows extensive and multiple fractures of the pelvis in a boy of five who was struck by a traction car. There was hematuria in this case, which cleared up in a short time. There was also fracture of the elbow as shown in Fig. 9.

The child made a complete recovery, with no other treatment than recumbency. Another case at present on my service likewise has multiple fractures of the pelvis with complete rupture of the urethra. Perineal section made on account of acute retention revealed such extensive laceration of the perineal structures, that I was persuaded, owing to the exceedingly bad condition of the patient, to do a suprapubic drainage.

The patient is recovering nicely and will soon be in condition to have a reconstruction of the urethra done.

Owing to the child's age, nine, and the extensive damage in the perineum, this promises to be no easy matter.

Fractures through the intertrochanteric line of the femur, with complete avulsion of the lesser trochanter, have come under my notice three times in the last six months.

This fracture which, from my experience of 3 cases in so short a period, must occur with greater frequency than we have hitherto suspected, if mistaken for an intracapsular fracture, might be treated by a method, the so-called Whitman method, by abduction, which would be disastrous, in that it would result in farther separation of the trochanter and contraction of the iliopsoas muscle.

Extension is likewise contraindicated as tending to displace the trochanter upward. My 3 cases all did well with just enough extension to steady the limb and with heavy sand bags placed so as to prevent rotation (Fig. 10).

In estimating the advisability or non-advisability of operative interference, the roentgenogram is of paramount importance. As before mentioned, however, we must be careful not to overestimate the gravity of the situation as revealed by it.

Extensive comminution even in the vicinity of joints, and especially in children, may, by careful remolding of the fragments, if done under control of the x-ray, be attended with good functional results (Figs. 11 and 12).

The indications for interference in fracture-dislocations at the shoulder have been mentioned by me on several different occasions.\*

Where the skiagram shows external rotation of the head with retraction due to the attached tendons of the supraspinatus and infraspinatus tendons, operative interference is imperative. When

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\**Surgery, Gynecology and Obstetrics*, July, 1915.



the detached head is in the axilla, it may under favorable conditions, and complete anesthesia, be reduced by manipulation.

From a rather extensive experience in fracture work extending over a number of years, and more especially from judgment based on the careful study of hundreds of skiagrams, I am more than ever inclined to believe that fairly good function is entirely compatible with rather unfavorable x-ray showings, and that eventually we shall arrive at a truer estimate of the necessity of operative interference.

If all the disasters due to ill-timed and injudicious interference in fractures were to be recorded, I am sure that many would hesitate who now rush in.

We must then regard the roentgen ray as a valuable aid to diagnosis, but we must not always base our prognoses on its findings, and it were well if some means could be found to convince juries that the x-ray photograph should not be the determining factor in coming to a verdict.

## GASTRO-INTESTINAL RADIOGRAPHY IN THE PRONE POSITION WITH THE PELVIS ELEVATED (TOUSEY'S POSITION).

By SINCLAIR TOUSEY, A. M., M. D., of New York.

The value of a radiograph made in the Trendelenburg position and preceded by a few minutes in the knee-chest position, in addition to a radiograph in the standing posture, was suggested to the author by Dr. W. P. Healy. The Trendelenburg position by itself had been used by other roentgenographers. The expectation was that such a picture would give better information as to the position in which the movable parts of the gastro-intestinal tract would be found at operation than a radiograph made in the standing position with every movable part sagging downward from the weight of its bismuth contents. I applied this method in a number of cases referred to me by Dr. Robert Coleman Kemp, some of them being cases in which Dr. Healy was the attending surgeon. The inconvenience and uncertainty of the transition from the knee-chest position to the Trendelenburg position quickly led to the device by the author of a method by which the patient lies prone upon the table with the head and trunk tipped downward at an angle of  $30^{\circ}$ . One part of the table to which the photographic plate is secured is lowered to this angle, while the limbs are secured to the horizontal part of the table by a strap passed across the back of the knees (Fig. 1). The full effect upon the position of the abdominal viscera is produced in a very short time. This position has the advantage of applying the plate to the front of the abdomen. A comparison of the pictures in the erect and in this new position proves to give information of the greatest value.

The standing picture shows the shape and position assumed by each of the bismuth-filled portions of the gastro-intestinal tract under the influence of gravitation toward the patient's feet. Some portions may be held up by adhesions or other lesions, in a position which is abnormal for the erect posture. The inference as to fixation may be corroborated or may require correction when we come to examine the other radiograph and note the relation of the affected part of the stomach or intestine to the umbilicus or to skeletal landmarks and also to other parts of the gastro-intestinal tract.

There may be portions which sag abnormally in the erect posture indicating probable benefit from supporting belts, providing the other picture shows a return to the normal position.

Coming now to the author's prone position with the pelvis higher than the shoulders, we find the bismuth-filled portions of the gastro-intestinal tract as far toward the patient's head as they would be found if an operation were performed. There is a certain normal picture in this position differing, of course, from that in the erect posture. There is the strongest tendency for the gastro-intestinal tract to assume this normal position, unless some portion is fixed in an abnormal position by adhesions or some other lesion.

A glance at the two pictures is usually sufficient as in Figs. 2, 3, 4 and 5 (cases referred by Drs. Healy and Kemp) to reveal the site of any abnormal fixation of the gastro-intestinal tract.

We now come to the relation of this information to the question of operation, in cases where the combined methods of radiography show fixation of some part or parts of the gastro-intestinal tract in an abnormal position by adhesions or some other lesion. If the radiographs or the symptoms show that there is sufficient angulation to cause serious obstruction, or if the symptoms are sufficiently severe and resistant to treatment, an operation is to be considered. In some cases the application of the *x*-ray and of high frequency currents from glass vacuum electrodes, exhausted to the ultra-violet degree, cures intestinal adhesions. In few if any cases presenting the fixation described, can a spontaneous cure be expected, but there are many cases where this abnormality may be safely let alone, and there are a few in which operative treatment is followed by fresh adhesions and a condition fully as bad as before.

850 Seventh Avenue.





Fig. 1.—Tousey's position for gastro-intestinal radiography, prone with the chest lower than the pelvis.



Fig. 2.—Gastro-intestinal radiograph in the standing position.



Fig. 3.—Gastro-intestinal radiograph in Tousey's position (prone with the pelvis higher than the thorax). The different parts of the large intestine all gravitate 4 to 6 in. toward the chest, and so does the abnormal residue in the stomach (Case referred by Dr. Kemp.)



Fig. 4.—Standing position. There is an abnormal residue in the stomach. The hepatic flexure, transverse colon, splenic flexure and angulated area of the descending colon are fixed by adhesions at the same level as in Tousey's position.

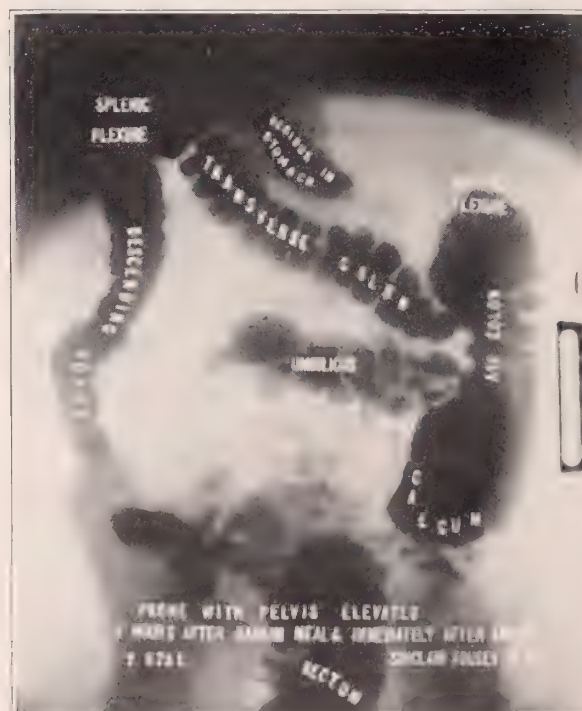


Fig. 5.—Tousey's position (prone with pelvis higher than thorax). Same case as Fig. 4, referred by Dr. Kemp.

## THE X-RAY IN THE DIAGNOSIS OF PULMONARY TUBERCULOSIS.

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The *x*-ray has been looked upon as of varying importance in the diagnosis of pulmonary tuberculosis. Hence, in the estimation of some the value of the ray is only of small degree, and again in the publications of quite a few others, we notice a tendency to place too great a value upon what the ray does or can disclose to help us in determining the existence of a pulmonary lesion.

There is obviously some factor which swings opinion one way or the other and causes the conclusions to be at variance. What may this factor be?

Perhaps it will not be amiss to consider roughly what the *x*-ray is, what it does, and what can be expected of it. In the first place, as used for diagnosis, the *x*-ray is merely a shadow projector. The ray does not penetrate all objects and thicknesses of objects with the same degree of facility; so that objects of varying density will cast shadows of varying intensity according to the permeability of the ray. Experiments have shown that this permeability depends very largely upon the specific gravity of the object through which the ray passes. And an *x*-ray picture will show nothing more than shadows.

The ray itself will penetrate any given object according to the conditions present at the time of its generation. By this we mean the degree of vacuum in the tube and the quantity and quality of the electric current generated by the machine. Also the variety of emulsion on the plate and the time of exposure largely influence the nature of the shadow cast. It will readily be seen that the distance of the point of ray generation from the object to be shadowgraphed will also influence the result.

All these points are mentioned merely to show that the technique of taking an *x*-ray picture may vary the result obtained. However, at the present time, the technique has been to a large degree uniform, so that this one factor perhaps is not at fault to any great extent in influencing the conclusions obtained in estimating the value of the ray as an aid in the diagnosis of pulmonary tuberculosis. What is probably most at fault is the basis and manner of interpretation. There is as yet an insufficiently exact standard of interpretation of the shadows seen in an *x*-ray plate of the



chest. The reason for this is obvious, inasmuch as we are dealing with shadows only. Nevertheless, there are characteristics which at times are well marked and which give a clue to the origin of the shadow.

The manner of interpretation may also be very largely at fault in determining the value of an *x*-ray plate in diagnosis. It is the custom of some men to go over a case clinically, to find evidences of tuberculosis in the lungs and then to approach an *x*-ray plate with the idea in mind that the plate must also show evidences of a tuberculosis. Consequently the shadows seen are interpreted in a biased way.

It is obvious that any means of diagnosis to be of value must be able, so to speak, 'to stand on its own feet,' and any conclusions drawn as to the value of any method of diagnosis must be from a thoroughly unprejudiced mind.

What can be expected of the *x*-ray as a shadow projector in the diagnosis of pulmonary tuberculosis? To answer this we must first consider what shadows a perfectly normal lung may show and also in a general way the pathology of tuberculosis of the lungs.

The mediastinal shadows, with the exception of the roots of the lungs, will not be considered here.

Looking at the picture of a normal lung we see entering at the root or hilus the larger bronchus and vessels, and radiating from these in more or less fan-shaped fashion, the divisions of the bronchi and vessels which gradually become lost as they approach the periphery. These shadows are continuous and are here and there marked by intersections along their course. The parenchyma of the lung casts no shadow. This is perhaps a true picture of the non-pathologic lung, but for purposes of diagnosis in adults would not represent the standard normal lung.

Tuberculosis of the lung, according to modern views, may originate in several ways. Thus it may be aerogenic, lymphogenic or hemogenic in origin. When aerogenic the tubercle bacilli may be taken into the bronchial tubes and become lodged, gradually setting up an inflammation and degeneration along the course of the bronchi. When lymphogenic the nodes or glands along the course of the bronchi may be the seat of involvement, and when hemogenic the parenchyma itself may suffer first. In general, then, it may be said that the primary involvement in the lung may be along the bronchi or in the parenchyma itself, or perhaps in the glands situated at the hilus, the seat of primary involvement not necessarily being the place of entrance of the bacilli.

When the tubercle bacilli have lodged, they produce changes which may become progressive or retrogressive. When progressive they result in caseation and ulceration and when retrogressive in fibrosis and calcification. For a long period the process may be

stationary. Therefore, according to the nature and extent of the infection and its location, the shadows seen in an *x*-ray picture will vary. Again it must be brought to the attention that the intensity of the shadow will vary with the specific gravity or density of the substance causing it. For this reason, under uniform circumstances, we should expect, as a tuberculous process advances, first the typical rounded tubercles of moderate density. When they are surrounded by inflammation or congestion, we might expect to see around the tubercles a hazy shadow of less intensity. As caseation begins, the shadows should become more intense and increase in intensity as fibrosis or calcification occurs, until it approaches in quality the shadow cast by bone. Then we could, according to the intensity of the shadow, form conclusions as to the nature of the affected area, and lay down certain fundamentals as a guide for the interpretation of abnormal shadows in the *x*-ray plate of the lung. An intense shadow resembling in quality that of bone could be used as an indication of calcification, one of less intensity as due to fibrosis or consolidation, and as intensity lessens, caseation and inflammation.

Cavity formation means the absence of tissue and consequently the absence of shadow or presence of a high light. If the cavity contains secretion, of course there will be a proportionate loss in the high light.

When we consider that the lung is not a plane, we can easily see how several shadows of varying intensity and representing lesions in the various stages can readily be superimposed and in this way lead to faulty interpretation.

However, it is not in the more advanced stages of pulmonary tuberculosis that the *x*-ray is called upon most often to assist in diagnosis. It is usually in the doubtful or very early conditions affecting the lung. For this reason we will confine ourselves to some of the conditions seen in the *x*-ray plate of early lesions.

It is a recognized fact that the vast majority of all adults will show by the various tuberculin tests that at some time in their lives they have had an infection with the tubercle bacillus. It is logical to assume that a proportion of these had the infection in the lungs, and that as healing has proceeded changes have occurred which will cause shadows in an *x*-ray plate. Hence, a proportion of adults will show upon *x*-ray examination, shadows which perhaps are not anatomically normal, but which nevertheless are not abnormal in the sense of existing disease. And it is largely in the differential interpretation of these shadows and those resulting from recent disease changes, that confusion results in establishing the value of the *x*-ray as an aid in diagnosis of the disease, pulmonary tuberculosis.

In the child, for instance, the glands at the root of the lung

should not be enlarged and cast definite shadows. But it is a common thing to find shadows at the root of the lung in an adult who is not suffering from pulmonary tuberculosis or any other disease. Therefore, when changes of a certain character are noted, the diagnosis must of necessity remain in doubt. And it is only by a thorough coordination of symptoms and physical signs that a diagnosis can be made with any degree of satisfaction.

What are the changes which may be expected in an early pulmonary tuberculous lesion?

Let us first consider the hilus or root. We have said before that, anatomically, the shadows seen here represent the larger bronchi, blood-vessels and glands. Under normal anatomical conditions, the hilus shadow should be one more or less diffuse and not broken by shadows of greater intensity. When these latter shadows occur, they may be said to be anatomically abnormal but not necessarily due to tuberculosis. Enlarged glands at the hilus in the adult may also be caused by anthracosis, silicosis, etc., so that the age and occupation of the patient must be considered. Nevertheless, when the shadows have a fuzzy outline and are seen to fuse, tuberculosis must be seriously considered.

Next we will take up a type which is characterized by small tubercle shadows along the course of the finer bronchi or perhaps blood-vessels, and which probably represent changes in the lymph-glands. This is the so-called peribronchial type. In this condition the parenchyma of the lung in all probability has not been involved.

We know that the characteristic lesion of tuberculosis is the tubercle. In the majority of all *x*-ray lung plates of adults, isolated tubercles can be seen. This is, however, not sufficient to warrant the diagnosis of pulmonary tuberculosis. However, when the tubercles are seen close together and when they have a fuzzy outline and do not seem very discrete, in other words when they give a picture described as mottling, then tuberculosis can with a large percentage of certainty be diagnosed as present. Mottling may be said to be one of the early shadows of a parenchymatous tuberculous lesion. This mottling may be very limited in extent and consist only of several tubercles which may have become conglomerate or are surrounded by a hazy infiltration and fuse with one another. When the infiltration in the lung becomes more marked, the hazy shadow grows in intensity, the smaller tubercles fuse into larger ones, and the shadows become larger. When consolidation has taken place and the depth of involvement increases, the shadow represents an increased thickness and becomes very intense, approaching in quality that of bone.

Early parenchymatous tuberculosis may give shadows of conglomerate tubercles apparently isolated in the lung, but more fre-



quently they are connected by strands of density approaching the hilus.

The conditions mentioned previously, of course, may occur in any portion of the lung picture. However, in early tuberculosis there are several regions which seem to be more commonly involved. It is a well-known teaching that tuberculosis of the lung most frequently affects an apex of the lobe and that usually the upper. X-ray plates taken of many early lesions of pulmonary tuberculosis in the adult will largely confirm this teaching. For purposes of convenience in diagnosing lung conditions, Schut has divided the chest into three triangles, in each of which it has been proved that certain pathological conditions are apt to occur. The upper triangle is bounded approximately by a line drawn from the middle of the clavicle to the seventh vertebral spine and by the spinal and clavicular margins. The middle triangle is bounded by the lower line of the upper, the spinal margin to the ninth vertebral spine, and by a line from this point downward and outward. The lower triangle lies below the middle one. It is in the upper triangle that the evidences of early tuberculosis, with the exception of the miliary type, are most frequently seen.

To sum up, the early lesions of pulmonary tuberculosis may cast shadows representing hilus, peribronchial, parenchymatous, or mixed involvement. It may be asked, Will the *x*-ray always cast a shadow when tubercles are present? It can certainly be assumed that there are tubercles so small as not to interfere with the passage of the ray in any way. The ray may simply pass on all sides, and owing to the distance of the plate and tube from the tubercle no shadow may be cast. Again the density of the tubercle may be such as not to hinder the passage of the ray, or the tubercle shadows and other shadows of the same density may be superimposed and the tubercle shadow lost. That these conditions actually occur is evidenced by the lack of tubercle shadows in very early miliary tuberculosis, and by the fact that a place taken in one position, anteriorly or posteriorly, may show tubercles not present in the other; so that it can truthfully be said that the *x*-ray will not cast a shadow of all tubercles. Nevertheless, we believe that under ordinary circumstances evidences of a tuberculosis of the lung should be visible on an *x*-ray plate early in the disease.

We have mentioned before that in the ordinary *x*-ray plate intersections of bronchi can be seen and that superimposition of shadows may occur. This is apt at times to prove misleading. Further to facilitate interpretation of shadows, the stereoscope is of distinct advantage. By the use of this apparatus depth or perspective is obtained and the position and source of the shadow are much more accurately determined.

At the Adirondack Cottage Sanitarium it has been the practice, when a patient is first admitted, that the history and physical examination be done by one man, the chest examination by another, and the *x-ray* picture by a third. Notes are made of all findings. When all the notes have been made the case is considered *in toto*, and all evidence for or against pulmonary tuberculosis is brought together and the diagnosis accordingly made. In this way each factor in diagnosis is made to stand independent of the rest. The *x-ray* is made to stand on its own feet. In taking all *x-ray* pictures a standard technique is used, so that, as far as possible, everything is uniform and the results of any picture should be the same whenever taken, provided no change in the condition of the lung has occurred. The following is briefly our technique:—

The anode is placed approximately 30 in. from the plate and on a level with the sixth dorsal vertebra. Approximately 50 or 60 milliamperes are passed through the tube, backing up a spark of about 8 in. All plates, if possible, are taken with the patient standing, his chest against the plate and his arms extended forward to draw the scapulæ out of the path of the ray. The patient is asked to hold his breath after taking a good inspiration and when he has done this, to signal the operator by a snapper device. The exposures are immediately made. By this method movement during exposure is rarely encountered. The length of exposure varies from one-eighth to three-fourths of a second, the depth and aeration of the chest being fully considered. Three plates are usually taken, two being a stereoscopic set and the other a posterior view.

For purposes of comparison we have arbitrarily considered certain symptoms when occurring in conjunction with other symptoms and not attributable to other causes, as indicating a positive history. These symptoms include hemoptysis followed by streaked sputum, frequent night sweats, pleurisy and continued fever. The finding of tubercle bacilli in the sputum was of course considered positive evidence when no throat or nose lesion could be found. Cough, expectoration, languor, anorexia, etc., when not accompanied by any of the positive symptoms mentioned above, were considered negative.

The physical signs, unless decidedly present, we have classified as negative.

With this method of classification we have compared history and physical signs with the *x-ray* evidence, and in a series of 95 very early and doubtful cases we have had the following results.

1. When the history and physical examination were positive,

the *x*-ray showed a lesion in 77 per cent. and failed to show a lesion in 23 per cent.

2. When the history and physical examination were negative, the *x*-ray failed to show a lesion in 58 per cent. and disclosed one in 42 per cent.

3. When the history was positive and the physical examination negative, the *x*-ray showed a lesion in 60 per cent. and failed to show one in 40 per cent.

4. When the history was negative but the physical examination was positive, the *x*-ray showed a lesion in 50 per cent. and failed to show one in 50 per cent.

At first thought these results may seem to indicate that the *x*-ray has but little value as an aid in diagnosis. But when we consider the basis of classification and the class of cases in which the comparison was used, the advantage that the *x*-ray affords is readily obvious. In only 23 per cent. of all cases were the history and physical examination both positive. In 35 per cent. of the cases both history and physical examination were doubtful or negative. The history only was positive in 32 per cent and the physical examination alone was positive in 10 per cent.

As the disease is more advanced naturally the percentage of definite lesions seen in the plate becomes proportionately greater. And it is a fairly common experience to find more extensive involvement upon *x*-ray examination than is detected by physical signs. At times, the difference is so great as to be astounding.

Plates taken at intervals in the course of the disease will show marked changes in some instances and at times these changes are detected before physical signs have perceptibly altered.

In the differential diagnosis of mediastinal and lung conditions the value of the *x*-ray is unquestionable, but this phase of the subject will not be dealt with here.

In conclusion, we would like to state that in our opinion the *x*-ray in diagnosis can be made to give, as nearly as possible without exploration or autopsy, evidences of the existing pathology in the lungs. It has been of distinct advantage in the diagnosis and better understanding of existing lesions in the lung, and with plates taken at intervals, changes for better or worse have been noted in the areas involved. Owing, however, to the fact that the *x*-ray is a shadow projector only, we do not think it infallible and that it should at the present time, at least, replace all other methods of diagnosis. Rather do we think it should be used in cooperation with all methods—an aid rather than an infallible means.



## ROENTGENOSCOPY (FLUOROSCOPY) VERSUS SERIAL ROENTGENOGRAMS.

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By FREDERICK W. O'BRIEN, M. D., of Boston.

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Barclay in the new edition\* of his thesis for the doctorate at Cambridge is so cocksure that screen examination in roentgenology is the only correct method for diagnosis of conditions of the alimentary tract that it has led me to examine the subject critically and present it briefly.

Certainly, we in medicine are striving for methods of diagnosis that are exact, and whatever method roentgenologists employ, be it roentgenoscopy or serial plates or a combination of both, will be accepted only in so far as it leads to more accurate diagnosis and must stand or fall on that basis alone.

Barclay's original paper might have been received as provisional, but his present work is the result of more experience, I take it, and will be looked upon as his mature judgment.

Roentgenologists employing the screen method constantly urge that serial plates are expensive and the results obtained out of proportion to the cost involved.

On the other hand, those using a series of plates assert that screen examination is dangerous to patient and operator, especially, and the results inadequate, not alone because of the danger element but because the method depends too much upon the personal equation and indirect ratiocination.

Neither the argument of expense nor danger is tenable. European workers marvel at the monies we spend in the roentgen departments of our hospitals and the sangfroid with which we discard to them very usable apparatus. They declare they cannot use serial plates even if it were their choice on account of the cost.

The only answer to this, however, is that if an exact diagnosis is the desideratum and serial roentgenograms will assure it, then roentgen departments must raise the money for the employment of the method. That there is no longer any real danger to patient or operator from roentgenoscopy would seem to be demonstrated by its long use chiefly in foreign clinics. These objections then cannot be considered real.

As you doubtless know, screen examination is a Continental practice. This may be explained partly by the fact that in great med-

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\*The Alimentary Tract, A Radiographic Study. By Alfred T. Barclay, M. A., M. D. New York: Macmillan Company. 1915.

ical centers like Vienna the clinics are large and time is a factor; also the high tension transformer so much in use in America and a prime requisite for proper gastro-intestinal work with serial plates is almost quite unused in Europe.

The surgeon, internist and patient care not what method the roentgenologist elects, but each has a vital interest that the method employed shall be the one most surely tending to a correct diagnosis.

Barclay blithely states: "From the outset—in 1906—it has been evident that a radiograph of the stomach contents, no matter how perfect, could be of little value in diagnosis, just as a photograph would be useless in depicting an ataxic gait."

It is said that every comparison limps. This of Barclay's limps figuratively as well as literally. Assuredly a series of photographs will depict an ataxic gait and indisputably if one knows how to read the photographs.

And this is the very answer of the champions of serial plates. If you know how to take the plates and read them you cannot be wrong. The plate will visualize permanently what your eyes may fail to detect by means of a fluorescent screen.

Perhaps the most striking observation one makes in reading Barclay and the writings of the roentgenoscopic school is that to prove and illustrate their screen findings they turn to the very object they loudly declaim as unreliable, viz., plates.

It is not easy to be patient with Barclay's dogmatism. I can only account for it by his self-imposed insularism.

Lest I appear hypercritical let me quote Barclay again. In the preface to the second edition of his book he writes: "There is still a widespread belief that a diagnosis can be made by taking a radiograph or a series of radiographs."

In contrast to Barclay, Case, of Battle Creek, who is considered abroad, at least in Vienna and Berlin, as representative of the Continental school in America, declares in his published monographs that while he prefers roentgenoscopy, yet because of its limitations he is forced to use serial plates to arrive at a correct diagnosis in large subjects and to rule out unsuspected gall- and kidney-stones and early carcinoma.

"In favorable subjects where the fluoroscopic image is clear, the screen study of the contour of the gastric silhouette is very satisfactory, although the writer for the sake of absolute safety from criticism usually makes several radiograms as a matter of record, even in cases satisfactorily studied by the screen method. In heavy patients ten or twelve radiograms usually suffice. On a number of occasions unsuspected gall- and kidney-stones have been discovered in this manner, and in patients too heavy for favorable

fluoroscopy the serial radiograms have made possible the discovery of relatively early carcinoma." \*

As to observing peristalsis and the elasticity of the pylorus which many roentgenoscopists insist can only be done with a screen, Case writes, "in observing gastric peristalsis the method (screen examination) is practicable however only in thin or medium-sized individuals. In the heavier patients the screen findings with reference to the pylorus are undependable, and one must make a series of plates in order definitely to determine the normal elasticity of the gastric walls in the pars pylorica."\*\*

Barclay is strongly seconded in America in his defence of screen examination by Dr. R. D. Carman, roentgenologist at the Mayo Clinic.

"I am a strong partisan of the screen," writes Carman, "and believe that its employment is absolutely requisite to a satisfactory inspection of the digestive tract. So-called serial radiography is by no means an efficient substitute, no matter how many plates are made or how much language is devoted to a description of the eccentricities they reveal. The only valid objection to the screen is possible danger to the operator, but with up-to-date protective apparatus I believe this danger is practically nil."

The advocate of serial plates might retort that screen examination is by no means an efficient substitute for serial radiography, no matter how much language is devoted to a description of the eccentricities it reveals, but he would not be any more logical than Carman.

Carman must prove that he can accomplish better results in diagnosis by screen examination than can be done by serial plates.

Carman has written extensively on the diagnosis of gastric ulcer by roentgenoscopy. He concludes: "The positive radiologic diagnosis of gastric ulcer can only be based upon the presence of two signs—namely, the niche, or the accessory pocket. Other signs which are corroborative but not diagnostic are the incisura, hour-glass stomach, residue in the stomach after six hours, lessened mobility, localized pressure tender point, delayed opening of the pylorus, acute fish-hook form of the stomach with displacement to the left and down, gastric hypotonus and antiperistalsis."

Which of these, I ask, cannot be demonstrated as well or better by serial plates, with the exception of 'localized pressure tender point,' which is not a roentgen sign at any rate?

The diagnosis of duodenal ulcer, however, remains the great battle ground for the two schools. Barclay, Carman and the

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\*Case: X-Ray Evidences of Gastric Carcinoma. (*Canadian Med. Jour.*, December, 1914.)

\*\*Case: Stereoroentgenography of the Alimentary Tract. Troy, N. Y.: The Southworth Company. 1915.



roentgenoscopic school in their diagnosis of this condition depend upon a so-called symptom-complex.

Barclay frankly states: "I believe this condition cannot be definitely determined by *x*-ray examination, but there is a symptom-complex, which is strongly suggestive, if not of actual ulceration, at any rate of irritation of the duodenum. The symptom-complex consists of the following signs: a normal stomach but always more or less hypertonic; active peristalsis; rapid emptying of the stomach; food seen passing through the duodenum with or without a persistent shadow in some part of the duodenum; a painful spot on deep pressure over the duodenum."

Cole has called attention to the fact that the symptom-complex varies with each observer but in the main that first described by Holzknecht is followed. George and Gerber have further made the point that roentgenoscopists have used various kinds of meals and varied the amount of bismuth or barium and yet have attempted to use the same functional data for diagnosis.

And Case is satisfied that the method is undependable. "The writer [Case] refers to the above symptom-complex of Holzknecht only to warn against its unreliability . . . . As a matter of fact the symptom-complex method is unnecessary since serial radiography and when necessary cinematography afford us a means of studying intimately the contractility of the entire gastric wall and of excluding even very small indurating lesions."

The most valid objection to the symptom-complex and the roentgenoscopic method is its failure in diagnosis. Carman has been able to diagnose but from 50 to 60 per cent. of duodenal ulcers with the screen, while those who use serial plates claim as high as 90 to 95 per cent. correct diagnoses proved at operation.

Because Barclay cannot demonstrate directly duodenal ulcer, he believes what he calls duodenal irritation to be of prime importance despite the fact that he tells us his symptom-complex denoting duodenal irritation may be caused by a multiplicity of things from a mouthful of septic teeth to a neurosis.

Barclay adds a note to his chapter on the small intestine in answer to Cole, George and Gerber in their claims to positive diagnosis of duodenal ulcer.

Paradoxical as it may be, his reply in effect is that he can diagnose a duodenal ulcer before a duodenal ulcer is present. Roentgenoscopically his symptom-complex denotes duodenal irritation which he is pleased to call "a clinical duodenal ulcer." While he admits that a scar of an ulcer may cause such deformity of the duodenal bulb as Cole, George and Gerber describe as positive of duodenal ulcer, yet he asserts that there is not any clue given as to whether this deformity is or is not of "present pathological significance." Its very presence denotes its pathological character.

but whether or not its presence necessitates surgery, which I presume is what Barclay means, that is something to be determined from a study of the entire series on the gastro-intestinal tract and by the consulting surgeon.

The majority of roentgenoscopists seem to believe that every deformity of the duodenal outline shown in a plate is claimed, by those using serial plates, to be diagnostic of duodenal ulcer.

"Deformity of the duodenal outline, especially the bulb," says Carman, "has been industriously lauded as a pathognomonic sign of duodenal ulcer by radiologists who depend mainly upon plates for diagnosis, but I am quite unable to share their enthusiasm. I have encountered many cases in which such deformity was due solely to spasm or to adhesions from a cholecystitis or simply from a lack of sufficient opaque media to fill the bulb."

Those employing serial plates do not say that every deformity of the duodenal outline is ulcer, if I read aright. What they do say is that a deformity of the duodenal outline, which appears constantly in a reasonable series of plates taken with the patient prone, standing and on the side, is pathological. Whether or not it is ulcer or adhesions depends on the character and constancy of the deformity. One perfect outline in the series, no matter how many plates might show a defect, would rule out ulcer.

It would seem fair, then, to conclude that roentgenoscopy alone is inadequate in the diagnosis of the more important conditions of the alimentary tract. It is useful for rapid work in thin or medium-sized patients only. It is impossible to diagnose gall- and kidney-stones by it directly unless they are gross, such lesions at times being the causative factor for which the roentgen examination has been instituted. By it early lesions of ulcer or carcinoma are overlooked. It fails to give one a permanent record.

Serial plates, on the other hand, will give one all the knowledge about the anatomy and physiology of the alimentary tract it is necessary to know and more about the pathology of the digestive tract than one can possibly learn with a screen. It gives one a permanent record. It must by the laws of physics visualize smaller defects than even the trained eye can perceive by a screen. It will, in fine, more certainly diagnose early cancer, small ulcers, unsuspected gall- and kidney-stones.

What humanity desires is a method that will mirror the minute early changes of disease. Serial roentgenograms to my mind have definitely challenged roentgenoscopy to parallel their work in the early diagnosis of disease.

# SIMPLE ROENTGEN ACCESSORIES.

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## STANDARD HEAD POSITIONS.

These various head positions with the patient lying upon the radiographic table are the usual standard positions.

There are many authorities who advise certain head exposures with the patient in the sitting position. Such exposures require more or less elaborate means of maintaining the plate in the upright position. Where roentgen installations are used in clinics which require only head negatives there is every reason for providing efficient devices to make exposures of the skull with the patient sitting in a chair.

With any standard tube stand and table it is probably easier to make skull exposures with the patient lying upon the table. It is a simple matter to place the patient's head in a comfortable position for the various exposures required and the recumbent posture certainly aids the quiet demeanor of the patient.

*Lateral Skull Exposures.*—The ambition of the radiographer is to secure an absolute lateral view with the frontal sinuses directly superimposed and the anterior processes likewise. There is no doubt but that this is a most difficult position. Stereoscopic exposures of the lateral position aid greatly in the interpretation, as the exact lateral position is not so necessary if this method is used.

Especially in negatives of the sella turcica for pituitary findings is the direct lateral view essential because of the changes in the sellar shadows with slight tilting of the head or the tube.

As an aid in securing the head in a lateral plane the Hickey wooden pillows (Fig. 1A) are excellent. These are shallow wooden boxes which may be piled, one upon the other, until the head is in an easy lateral position. The different shoulder measurements of patients prevent the use of a single box which will fit all patients.

These wooden pillows are easily constructed out of soft pine lumber. They should be at least 12 in. long and 10 in. wide with a depth of  $1\frac{1}{2}$  to 2 in. It will not be necessary to have more than three or four of them. The one which is used on top may be covered with a flat sheet of lead to back up the plate.

The patient lies upon the table upon the side with the nether shoulder behind so that the patient rests somewhat upon the chest. The Hickey wooden pillows are built up under the head so that a lateral plane is obtained (Fig. 2). The height of the patient's nose from the floor is measured, and a mark placed about 5 ft. away at this same distance from the floor, so that the patient will have a convenient object upon which to focus the eyes as an aid to maintaining position. Gauze pads may be used between the patient's head and the plate and between the head and the apparatus.

Plates 10 by 12 in. in size are best for lateral exposures of the entire skull. Eight by 10 in. plates or even smaller ones may be used for exposures of the sella turcica or for the accessory sinuses alone.



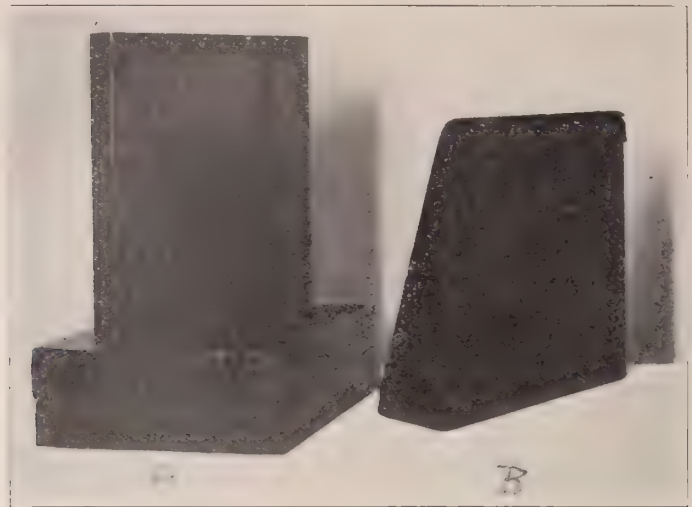


Fig. 1.



Fig. 2.

Stereoscopic exposures may be satisfactorily made by using Bowen's aluminum plate holder (Fig. 3) superimposed upon the wooden pillows.

The focus point varies according to the results desired. For the complete lateral skull exposure, Schueller recommends a point just

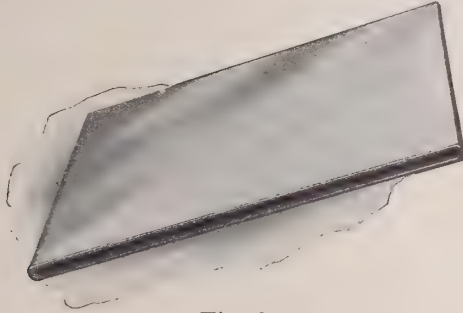


Fig. 3.



Fig. 4.

anterior to the external auditory meatus. Others advise a point midway between the external angular process and the external auditory meatus. For exposures of the frontal sinuses the tube may be centered over the gabella. For exposures of the sella turcica, Schueller advises a point above and forward to the external auditory meatus.

*Postero-Anterior View.*—For this exposure it is convenient to use the well-known wooden wedge device (Fig. 1B). This wooden device is a 10 by 12 in. board which is made up with the angle of its surface at about  $25^{\circ}$  to the base. A sheet of lead covers the surface.

The patient lies upon the abdomen and rests the forehead and nose upon the wedge. To obtain good shadows of the sinuses Caldwell recommends that the focus point of the tube should pass through a plane which passes through the gabella and about three-quarters of an inch below the parietal eminences on each side (*Am. Quart. Roent.*, Vol. I, No. 2, p. 27, 1907). This focus point is therefore considerably above the occipital protuberance.

A new position for postero-anterior exposures has just been presented by Waters and Waldron (*Am. Jour. Roent.*, Vol. II, p. 633, 1915) which secures the shadows of the frontal, ethmoidal and maxillary sinuses without the superposition of any shadows of the petrous portion of the temporal bones.

The patient is placed face down on a horizontal table with the chin resting on the cassette holding the plate and intensifying screen. A compression diaphragm of 18 cm. in depth is screwed down tightly upon the occiput with a felt pad 2 cm. thick interposed (Fig. 5).

Approximately an angle of  $45^{\circ}$  is formed by the vertical axis of the head with the plate (Fig. 6), but as this is

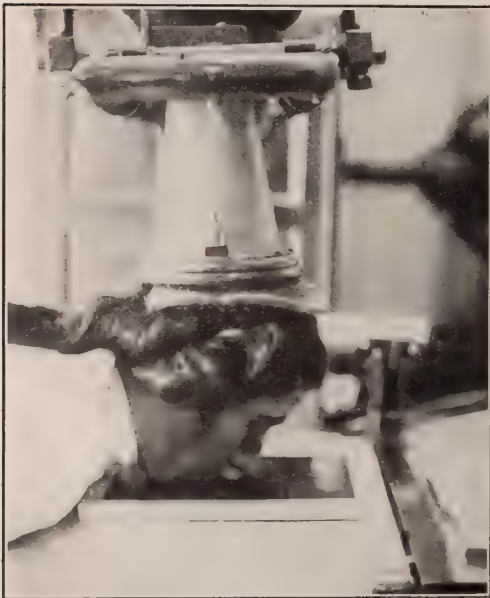


Fig. 5.

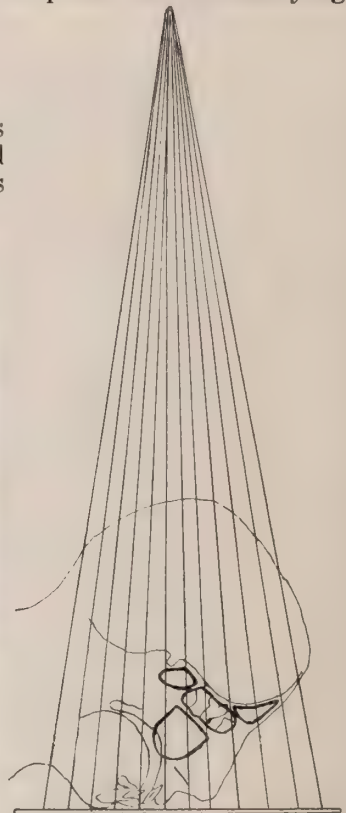


Fig. 6.

difficult to obtain, we have discarded this point as unnecessary. It will be shown that only three points are essential in order to obtain roentgenograms of this region as described:—

1. The chin should always touch the plate.
2. The long axis of the tube should be parallel to the plate.



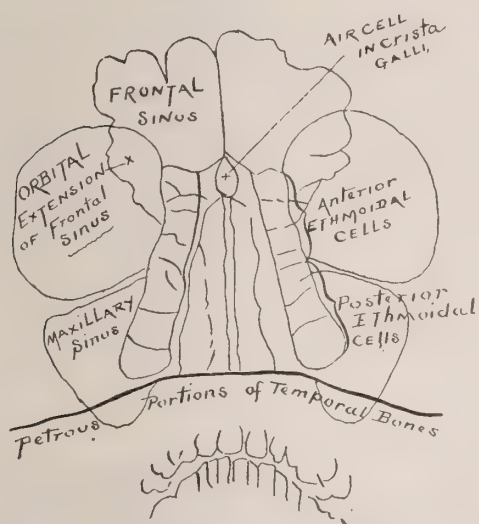


Fig. 7.

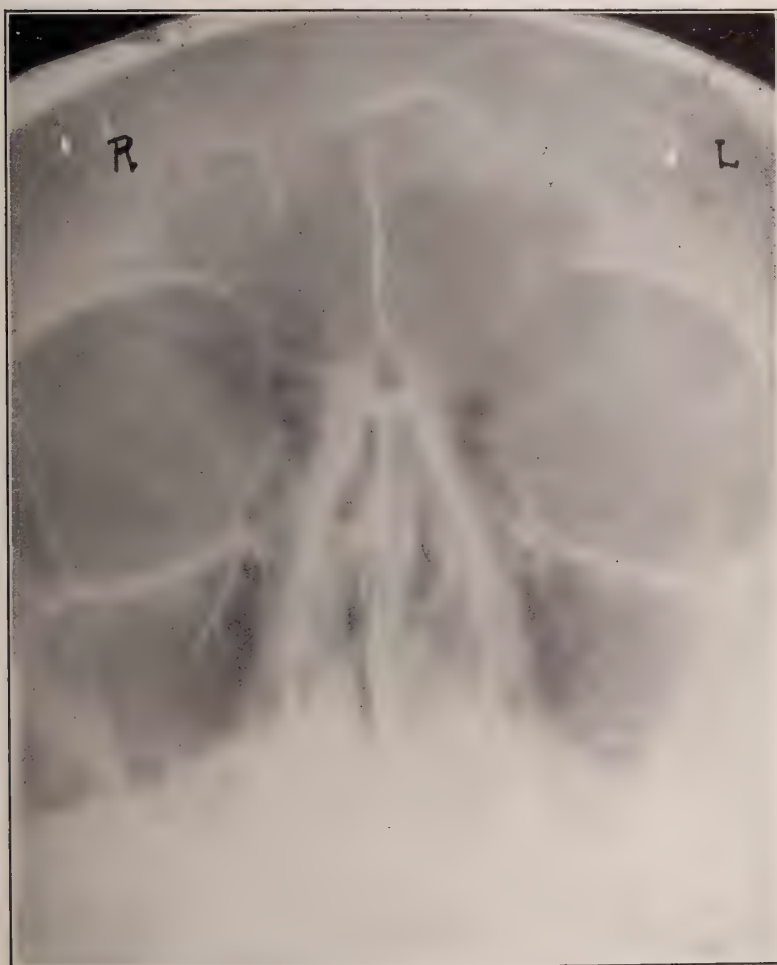


Fig. 8.

3. The nose of the patient should be from 1 cm. to 1.5 cm. from the plate.

Under no condition should the nose rest on the plate.

Under this rule the importance of knowing which style of head one is dealing with is obvious. For instance, in the convex-shaped face, as shown in Fig. 5, the nose is 1 cm. from the plate, whereas in the concave-shaped face the distance of the nose from the plate should be increased about  $\frac{1}{2}$  cm., with the tube still remaining parallel to the plate.

Therefore it is the distance of the nose from the plate, with the long axis of the tube parallel to the plate, which enables one to make roentgenograms of the accessory nasal sinuses (Figs. 7 and 8) without projecting the basal structures of the skull into the maxillary antra.

*Mastoid Exposures.*—The method proposed by Lange in 1909



Fig. 9.

(*Am. Quart. Roent.*, Vol. II, No. 1, p. 1, 1909) has been quite generally copied and successfully applied.

Lange's oblique postero-lateral position (Fig. 9) requires that the patient lie on the side with the mastoid resting upon the plate, and the rays are directed from above (cephalad) and behind, entering obliquely just below the parietal eminence of the upper side, and pointing toward the mastoid process of the opposite side. The axis of the compression cylinder is tilted upward (cephalad) at the

angle of  $25^{\circ}$  from the plane of the base of the skull (Reid's base line), and inclined backward  $20^{\circ}$  from a plane passing vertically through both external auditory meati.

Hickey describes his position as follows: "The patient lies upon his back with the head resting upon as large a plate as a 10 by 12, and the small cylindrical diaphragm is adjusted over one mastoid with the central rays accurately determined by the indicator. This indicator is allowed just to touch the tip of the mastoid, and the cylinder is tilted at an angle of about  $5^{\circ}$ . The cylinder is then moved to the opposite side and centered over the opposite mastoid with the central rays determined by the indicator. The cylinder is tilted in the opposite direction to an angle of about  $5^{\circ}$ . The exposures are made on the same plate, the cylinder and lead glass shield being sufficient to keep the two fields separated without blurring.

"In presenting this position for taking the mastoid, Hickey does not intend to supplant at all the lateral method of investigation of the mastoid, but simply to afford a simple means of checking up the results which are obtained by the lateral exposure. Furthermore, we do not obtain in the anteroposterior position the anatomical information which has a very important diagnostic importance" (*Am. Jour. Roent.*, Vol. I, p. 321).

Beck describes his position as follows: "The patient lies flat upon the abdomen, as shown in the illustration; the face turned to the right for the left mastoid and vice versa. The same inclined head-rest (wooden wedge) is used as for the postero-anterior position. The plate is interposed between the head and head-rest, the ear being placed near the centre of the plate and the head so inclined that a plane bisecting it from before backward is parallel with the plane of the head-rest. The tube is directly above, parallel with the table (not the head-rest), the compression cylinder resting upon the uppermost parietal bone." (*Atlas of Radiography of the Mastoid Region and of the Nasal Accessory Sinuses*, p. 6.)

The difference between the Lange and Beck mastoid position is readily seen. Beck focuses straight down through the parietal region to the mastoid of the opposite side which rests upon the wooden wedge. Lange focuses from a point farther back and tilts the tube toward the mastoid resting upon the plate. Lange's mastoid position seems to give better definition to the lateral sinus and has been more universally followed.

*Lower Jaw.*—To obtain shadows of the molar and cuspid teeth and the lower jaw of one side without the superposition of the opposite jaw is comparatively simple if the position recommended by Hænisch is used. This same position has been described by Pfahler and many recent dental radiographers.

The patient rests upon the table with the affected jaw upon the wooden wedge with the high part of the angle at the neck (Fig. 10). It will be noted that the top of the head tilts toward the table. By directing the compression cylinder from below upward and from behind forward one can obtain a portion of the lower and upper jaw of the side next to the plate from the cuspids to the condyles. A good view of the upper posterior teeth is obtained by focusing the tube just below the angle of the jaw and tilting the compression cylinder upward and forward.



For those who may wish to pursue head radiography with the patient in a chair, Brown (*Am. Jour. Roent.*, 1915, No. 5, Vol. II, p. 680) offers an elaborate apparatus which insures absolute immobilization of the head independent of the plate and tube, thus permitting stereoscopic exposures if desirable.

*The Sphenoidal Sinus.*—The lateral skull view gives shadows of the depth of the sphenoidal sinus, but one cannot thus judge of the right or left side of this sinus from such a roentgen negative. The postero-anterior projection is practically useless, for the sphenoidal shadows are confused with the ethmoid cells and base of the skull.

There are, so far, three positions of studying the right and left portions of the sphenoidal sinus.



Fig. 10.

Pfahler recommends that (*Am. Quart. Roent.*, Vol. IV, p. 60) an oblique position may be used for each side, and both sides should be made for comparison. The patient's head is placed so that the brim of the orbit is resting upon the plate (Fig. 11). This will make the weight of the head rest upon the superciliary ridge, the nose and malar bone. The tube is placed at a distance of 22 in. from the plate and in such a position that the central ray will enter the opposite parietal region about 2 in. posteriorly and  $1\frac{1}{2}$  in. above the external auditory meatus and projected toward the centre of the orbit.



Fig. 11.



Fig. 12.

If this plate is properly made, the optic foramen will occupy the centre of the orbit, and to the outer side will be found the sphenoidal fissure. Then toward the median line will be projected the sphenoidal sinus—anterior to the optic foramen. Above this will be seen the upper brim of the orbit and above the orbit the frontal sinuses.

The rays may also be projected through the vertex of the skull as suggested by Pfeiffer (*Arch. fuer Laryngol.*, Bd. XXIII, 1910): The plate-holder is laid flat upon a table, and the patient, sitting on a low stool, is brought close up to the edge of the table. His chin is then thrust forward as far as possible over the

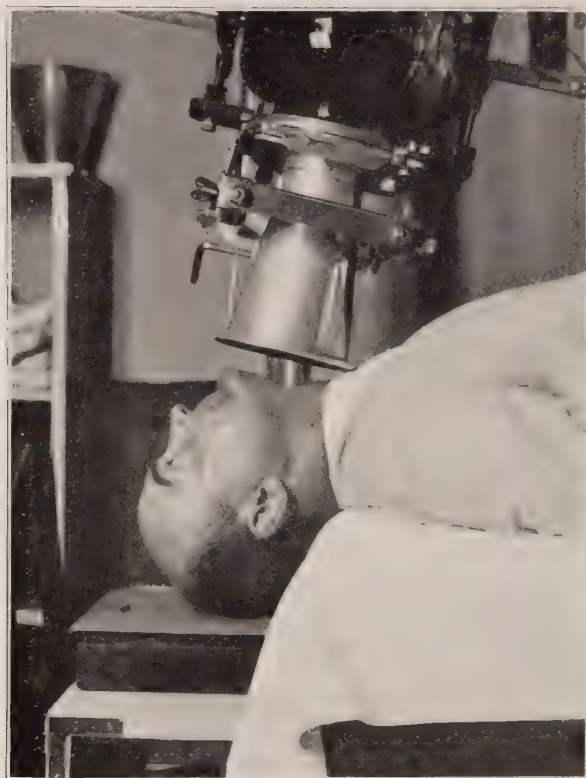


Fig. 13.

plate, great care being taken at the same time that the base of the skull maintains the horizontal and remains parallel with the plate. The compression tube is then focused upon the vertex of the head in such a position that the axis of the rays passes through the skull in the vertical plane at a point 2 cm. anterior to the central point of the external auditory meatus (Fig. 12).

As an alternative procedure to this, Bowen (*Am. Jour. Roent.*, Vol. I, p. 450) suggests that the patient may be laid upon his back with the head hanging over the end of the table, and with the vertex resting upon the plate-holder, which is placed upon a stool. The compression tube is adjusted against the under surface of the extended chin, the same care being taken as before to direct the rays



through the same vertical plane. Bowen extends the head to the position where a line from the tip of the nose to the external auditory meatus is parallel to the plate and centers over a line from mid-larynx to mid-chin at a point one inch anterior to the external auditory meatus and perpendicular to the above base-line and plate.

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## DARK ROOM HINTS.

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### DARK-ROOM ILLUMINATION.

A good discussion of dark-room illumination is furnished by Dr. E. W. Caldwell (*Amer. Jour. Roent.*, 1915, Vol. II, p. 684). Formerly all dark rooms were painted a dead black to prevent the reflection of actinic light. The Rockefeller Institute recently installed a dark room with white walls, which, while satisfactory, presupposes that *absolutely* no rays of light enter by any cracks whatever. On account of the dangers of such a white dark room from crevices in the door casings, etc., Caldwell recommends a red paint. Red paint will reflect red light as easily as white walls. The darker the pure red lead paint, the greater the safety.

Caldwell further recommends indirect illumination by means of any commercial indirect fixture and a red ruby lamp, being especially careful that the tip of the ruby lamp does not transmit white light. A cheap fixture may be made by suspending an ordinary drop light 18 in. from the ceiling and hanging beneath this a deep tin baking pan. This permits enough safe red light to do away with the former use of transillumination during development.

This idea of indirect illumination can be carried out successfully in fluoroscopic rooms where green lamps are most satisfactory and the walls are painted green or a blue grey. A small rheostat may be mounted conveniently so that the degree of illumination in the fluoroscopic room may be easily regulated.

THE SIXTEENTH ANNUAL MEETING OF THE AMERICAN  
ROENTGEN RAY SOCIETY.

(Reported by E. H. Skinner, M. D., Kansas City, Mo.)

The sixteenth annual meeting of the American Roentgen Ray Society at the Hotel Chalfonte, Atlantic City, was called to order by the president, Dr. A. L. Gray, of Richmond, Virginia. Dr. Willis F. Manges, of Philadelphia, was at the Secretary's desk and Dr. Leonard Reu, of Buffalo, Treasurer, was at the Registration desk.

Several members of this society are serving at the hospitals for soldiers in Europe. Many of the active members are with the Allies in France, and several honorary members are serving on German hospital staffs. Resolutions were passed conveying greetings and hopes for the continued safety of these members.

The Publication Committee reported a change in the business management of the *American Journal of Roentgenology*, the official journal of this society. Mr. Paul B. Hoeber, a medical publisher of New York, will undertake the business management and printing of this journal. Dr. Preston M. Hickey, of Detroit, will continue as Editor-in-Chief, with a collaborating editorial staff of seven members.

Resolutions upon the death of Dr. George H. Stover were passed. As is the custom, the Society paused for ten minutes in his honor, during which period there was a memorial address and remarks by several members.

The scientific program was opened with a symposium upon roentgenologic teaching. Dr. Fred C. Zapffe, of Chicago, classified the scope and efficiency of the roentgen work in the medical schools of America. There seems to be no uniformity whatever. Attention was drawn to the necessity of some action by this representative organization, which would establish the proper position of roentgenology in the college curriculum. Dr. Lewis Gregory Cole, of Cornell Medical School, spoke of the development of the art of roentgenologic technique and the science of roentgen interpretation. Dr. H. K. Pancoast drew attention to the growing dependence of the internist and surgeon upon roentgen findings and the necessity of undergraduate teaching for the purpose of acquainting the medical student with the fundamental principles and scope of roentgenology. He favors the 'case method' of teaching roentgenology, elaborated by Dr. Percy Brown, of Boston. It was the general consensus of opinion, as expressed by the essayists and discussors, that the technical details of roentgenology are essentially the function of the specialist whose development was a matter of thorough post-graduate education and apprenticeship.

A committee of five teachers of roentgenology is to be appointed to elaborate a scheme of roentgen instruction in undergraduate medical schools.

A symposium upon dental roentgenography was contributed by Dr. Byron C. Darling, of New York, and Dr. A. M. Cole, of Indianapolis. The value of the radiograph to visualize the destruction caused by oral sepsis was graphically shown by lantern slides, as

well as the value of the roentgen interpretation to the proper treatment.

Dr. S. B. Childs, of Denver, offered "A Plea for Conservatism in the Treatment of Closed Fractures From the Roentgenologic Standpoint." He wished to demonstrate the capacity of Nature to mould callus and fragments even where the roentgen shadows showed faulty alignment and the functional result did not seem promising.

Dr. Preston M. Hickey exhibited negatives demonstrating the "Value of the Lateral View of the Hip." These negatives were made by placing the patient upon the affected hip with flexion of this hip upon the abdomen and extension of the other thigh. The tube is focused somewhat obliquely from below upward toward the greater trochanter of the affected hip, the plate being beneath the greater trochanter. This new position is an extremely valuable contribution.

Dr. Amadee Granger, in presenting "The Use of Oxygen in Roentgenology of the Genito-Urinary Tract," felt that oxygen expansion was far less irritating to the bladder than air inflation and was equally convenient. He offered a preliminary report upon oxygen inflation of the kidney pelvis for roentgen delineation.

Dr. Manges reported the filling of the kidney pelvis with opaque solutions under fluoroscopic control. He was forced to defend the high milliamperage which he employed to secure satisfactory shadows, but the value of the method was demonstrated rather conclusively, especially where the roentgenologist was obliged to secure his results at one séance with no possibility of a re-examination if the filling of the kidney pelvis was found incomplete after negatives were developed. His method is pursued upon a horizontal roentgen table with a very small diaphragm, the patient being upon his back. This method was especially valuable in controlling the amount of injected opaque solution so as not to over-distend the pelvis and force the solution into the parenchyma of the kidney.

The symposium upon roentgen physics by Dr. J. S. Shearer, Dr. W. D. Coolidge and Dr. Hull was illuminating. Dr. Shearer presented the subject of "Roentgen Ray Measurement and Dosage," calling attention to Christen's half-value layer factor in the measurement of dosage. He stated that measurements will not eventually require the frequent use of pastilles or other methods of relative inaccuracy, but that constant factors, obtainable by meter readings, can be reproduced as desired. The standardization of irradiation is not far distant.

Dr. Hull spoke of the  $x$ -ray spectrum. The researches of Bragg upon the spectral effects of the  $x$ -ray by means of quartz crystals will be applicable in a practical manner, inasmuch as Barkla has demonstrated that the measurement of  $x$ -ray intensity by the ionization chamber is correct. It becomes necessary, however, to have exciting apparatus with an unfluctuating voltage and a constant potential, and tubes which will maintain a definite equilibrium without fluctuation.

Dr. Coolidge indicated the necessity of a Bureau of Standards to have a check upon the manufacturer, so that the efficiency of transformers may be standardized. The time is coming when the roentgenologist will not of necessity be required to be a physicist and an electrical engineer, and then he can devote himself entirely to the



diagnostic interpretation of roentgenograms and therapy. He exhibited several new types of the Coolidge tube with new forms of cathodes and anodes, constructed to secure protection at the source of the ray. Regarding the focal point, Dr. Coolidge demonstrated that the mere inspection of the frosted area of the anode was no criterion of the focus, and that the manufacturer should be forced to furnish a film photo of the focal sharpness. He suggested that the sharpness of a shadow of a pinhole in a lead plate, midway between the anode and the plate, was a satisfactory method, the tube to plate distance being about 14 in. Dr. Coolidge showed a small tube of  $3\frac{1}{2}$  in. diameter, which is equally efficient as the standard 7 in. bulb. The only reason why he had adopted the latter size was because most apparatus in general use was adapted to this size. The smaller sized bulb will afford the use of much less cumbersome protection tube stands.

Dr. Lewis Gregory Cole exhibited the model of an experimental device for eliminating the effects on the plate of the secondary rays excited in patients' tissues during the roentgenographic exposure. It consisted of a moving diaphragm just beneath the *x*-ray tube and a slotted lead mask which was placed directly over the photographic plate. The moving diaphragm and the slotted lead mask should work synchronously. The resulting exposures showed remarkable detail and excited a great amount of interest. Dr. Caldwell considered the experiment similar to the Bucky diaphragm effect, but Mr. Snook thought that Dr. Cole's device would eliminate the secondary rays of the patient in a more efficient manner. The mechanical details to be overcome in the practical application of Dr. Cole's device are left to future development. Dr. Cole recalled the traveling diaphragm shown by Dr. Pirie two years ago.

Dr. Shearer, in closing the discussion, inclined to the belief that photographic measurements of dosage are still quite valuable until universally available electrical measurements are standardized. He drew attention to the fact that filtration does not add penetration, and that while an unfluctuating voltage is desirable, it is not absolutely necessary. It was, however, extremely valuable to be able to stabilize the heating of the filament of the Coolidge tube.

In the symposium upon the chest, Dr. G. W. Grier, of Pittsburgh, showed an original arrangement of a vertical and horizontal fluoroscopic apparatus for facilitating successful bronchoscopy where the foreign body is beyond the main trunks of the bronchi or in the upper bronchi. The collaboration of the bronchoscopist and the roentgenologist was convincingly argued. Dr. Grier warned against the use of the fluoroscope and forceps without the bronchoscope, and reported several untoward results.

Dr. Kennon Dunham made a further contribution upon animal dissections in an effort to determine the anatomical structures which produced the roentgen shadows seen in the periphery of the lungs in tuberculosis.

Dr. F. S. Bissell advanced the hypothesis that the shadow changes in early tuberculosis of the lungs were not due to a process of fibrosis, as stated by Dunham in his stereo-clinic, but to the actual encroachment upon surrounding tissues by the actual tubercle itself. From clinical studies of 297 cases, he concluded that there was a distinct correlation between constitutional tuberculin reactions and the characteristic interweaving of the lung striæ.

Dr. A. B. Moore and Dr. R. D. Carman showed a series of lantern slides illustrating metastatic carcinoma of the lung.

Dr. H. W. Van Allan, of New Haven, presented a method of roentgen pelvimetry which depended upon the reconstruction of triangles from the shadows obtained upon five screen plates, in which the tube focus is displaced 6 in. in the four directions from that of the first plate, which is focused over the upper part of the sacrum anteriorly. He claimed this to be a simpler method than the stereoscopic pelvimetry previously reported by Manges. Dr. Manges said that the point of greatest importance was the proportion between the size of the pelvic inlet and outlet and again the proportion between the size of the pelvic strait and the fetal head. Therefore he had recently taken to making pelvimetric roentgen exposures during the eighth month of gestation, as a most practical measure.

Dr. A. W. George, of Boston, read a paper on the roentgen study of gall-stones and gave a surprising percentage of positive diagnoses. He uses screen plates and repeats his exposures again and again, especially if there is the least suspicion of gall-stone shadows upon any one of the early plates. Especially where the patient's history points to gall-stones, he finds that perseverance and attention to a rapid technique will ultimately be rewarded by a very high percentage of gall-stone shadows.

Dr. L. T. LeWald, of New York, showed roentgen slides which illustrated the results of his studies upon syphilis of the stomach, and the normal and pathological anatomy and physiology of the digestive tract of children. These studies have already been published.

Dr. W. H. Stewart, of New York, in a paper on the "Roentgen Diagnosis of Obscure Lesions of the Gastro-Intestinal Tract," inclined to a demand for the accumulation of clinical laboratory and roentgen findings, for he finds that one cannot always depend upon roentgen shadows alone, especially in the obscure cases. He also demands the privilege of a thorough *x-ray* examination of the entire alimentary tract, just as the roentgen examination for urinary calculus cannot be considered complete unless both kidneys, the ureters and bladder are covered by roentgen exposures before a negative report becomes valuable. Dr. Stewart reported a case where there was a perforation between the transverse colon and the gall-bladder, where the opaque enema entered the hepatic ducts, giving remarkable detail to the branching of these ducts and furnished a diagnosis of an otherwise obscure lesion.

Dr. A. W. George presented the roentgen study of 5 cases of early annular defects at the pylorus which he now considered pathognomonic of early adenocarcinoma demanding surgical attention. These cases gave no clinical indication of the seriousness of the gastric lesion. Operative and pathological proof in these cases has been secured. Even upon the operating table the gross pathology of these lesions did not seem to warrant the radical surgery which the roentgenologist advised and which the microscopical study substantiated later. In discussion, several other roentgenologists reported similar cases where the character of the demonstrable roentgen lesion appeared much larger than the pathological anatomy at the operation seemed to reveal. Only the microscope substantiated the roentgen findings. George drew attention to the great responsibility which this placed upon the roent-



genologist and the delicacy of his position relative to the patient and the attending physician.

Dr. R. D. Carman, of the Mayo Clinic, read a paper on "Duodenal Ulcer," in which he placed the duodenal defect, as pointed out by Cole, as a major sign in duodenal diagnosis. He reiterated his confidence in the value of the other major and minor signs, which he has published previously.

Dr. James T. Case, of Battle Creek, Mich., reported on the "Duodenum with Special Reference to Lesions Beyond the First Portion." By pressure upon the transverse portion of the duodenum, one may dam back the opaque meal and thus secure a filling of the second and part of the third portions of the duodenum, as pointed out by Lippman and Holzknacht, which will reveal dilations of the ampulla of Vater and duodenal diverticula or perforations into adjacent viscera. It is not unusual to see the writhing duodenum, especially in thin subjects, and this is not to be considered as diagnostic of obstruction at the duodeno-jejunal junction, as claimed by Jordan. In many of Case's patients showing a dilatation of the ampulla of Vater, he has demonstrated multiple diverticula of the colon and even of the jejunum. Case recommends this examination of the second and third portions of the duodenum on the horizontal table, turning the patient rapidly to any position giving good visualization after the patient has rested upon the right side. His examinations are usually made with the screen, plates being used to record the shadows.

In the discussion on the preceding gastro-intestinal symposium, Dr. Lewis Gregory Cole said that the reliability of roentgen evidence in gastro-intestinal diagnosis placed a great responsibility upon the roentgenologist and forces him to measure up to this demand for expert advice. He cited cases where the forceful arguments of the roentgenologist, based upon roentgen findings, seemingly at variance with the clinical picture, were rewarded by operative proof. But this very insistence upon the value of the roentgen evidence which seems inconsistent or fails to check up with the clinical picture, forces the roentgenologist to be constantly alert and extremely careful in his diagnostic roentgen methods and interpretation.

Dr. Manges believes we sometimes pay too much attention to small individual lesions and fail to secure the sum total of diagnostic data obtainable by the complete roentgen examination of the gastro-intestinal tract. Very often the lesions are multiple and the preponderance of clinical manifestations to one viscus obscures the possibility of pathology in another part of the abdomen. He is assured that the complete abdominal roentgen examination gives more information than the exploratory laparotomy.

Dr. A. W. George stated that it had been his experience that where duodenal deformities were due to adhesions, the defects in the roentgen shadows show up immediately after the barium and buttermilk meal, and tend to clear up as the stomach and duodenum fill up, while in the ulcer deformity the duodenal defect becomes more noticeable about half an hour after the opaque meal. If duodenal ulcer is suspected, he gives only one-half the usual meal, or 250 c.cm., and the best negative is obtained half an hour later.

The symposium upon irradiation therapeutics was of unusual interest and enthusiastic hopefulness. The advantages of deep roent-



gen therapy in massive measured doses were demonstrated to have a unique influence in various biological directions.

Dr. Wm. S. Newcomet, of Philadelphia, and Dr. R. H. Boggs, of Pittsburgh, read on "The Comparative Values of Radium and Roentgen Irradiation." It seems to be established that the effect of radium does not penetrate more than two to three centimetres, and therefore the combination of deep-filtered roentgentherapy is necessary for results. The value of radium in cavities is maintained, but the Coolidge tube technique is advised at the same time. The depth to which the roentgen ray may penetrate with appreciable result has increased and become easier of application since the newer tubes have been marketed.

Dr. A. F. Holding, of New York, reported on 530 cases of classified malignancy, in which deep roentgentherapy was supplemented by certain adjuvant therapy, such as heat at 55° C., diathermy, etc. This report showed that remarkable improvement was obtained in some cases that seemed absolutely hopeless.

Dr. G. E. Pfahler and Dr. J. D. Zulick reported on the "Treatment of Exophthalmic Goitre by Roentgentherapy." They agree with Kienboeck and others that no case of Graves' or Basedow's disease should be operated until roentgentherapy has proved ineffectual. The effect of the treatment may be guided by the change in tremor, pulse-rate, nervousness, and weight. All of these effects seem to parallel each other in their return to normal. The size of the gland has been reduced in over 50 per cent. of Pfahler's cases. In his technique, Pfahler makes roentgen negatives of chest, both for record and diagnosis of intrathoracic goitre. He always treats the thymic area when treating goitre. The duration, age, circumstances, and other factors influence his technique. Ordinarily, however, he gives massive roentgen doses over several areas for cross-fire, and does not repeat the series for at least three or four weeks. One must be careful not to treat the case so that hypothyroidism results.

Dr. Sidney Lange, of Cincinnati, reported on "Recent Results in Menorrhagic and Uterine Fibroids in Fifty Cases." He reported such large doses at such short intervals that he hesitated to report his technique. The results reported were unusually rapid, which Lange attributes to the vigorous technique employed. He takes as his guide, in the repetition of treatments, the cessation of menstruation, and believes that if sufficient irradiation is absorbed by the ovary, the menses are sure to cease. He directs his exposures at the ovaries alone, and so crossfires that both ovaries are in the path of the ray at each exposure. In many of Lange's cases only one series of exposures was necessary for results.

Dr. George C. Johnston, of Pittsburgh, read upon the treatment of malignancy by deep roentgentherapy, advocating the crossfire method over extensive areas in recurrent breast cancer. He showed the model of an apparatus with a protected tube box, adaptable to these cases and unique in its adjustment to the axilla and supra-clavicular regions.

Both Dr. Pfahler and Dr. Lange presented methods of avoiding or counteracting the effects of deep irradiation. Dr. Pfahler finds a wide variation in the display of symptoms attributable in part to the sensitiveness of the patient. He tries to eliminate the discharge from wires leading to the tube, and places fans to change the air

about the patient. He finds that more than one fan is necessary. He also has devised an apparatus for supplying oxygen and air direct to the patient, which has the appearance of a nitrous oxide mask.

Dr. Lange finds the untoward effects increase with the voltage used. He suggests the hypothesis that an acidosis is produced during irradiation, which can be counteracted by giving the patient some alkaline substance. Therefore he has his patients take sodium bicarbonate, 30 gr. q. i. d., for two days before and after treatments. He maintains an alkaline urine and prescribes Vichy water or lime water as a drink.

In discussion, Dr. Kennon Dunham, of Cincinnati, reported 57 cases of carbuncle which received only one massive roentgen dose, from which each case seemed to be benefited. This treatment was now pursued as an empirical measure, but he asked that others attempt to help him find the reason such uniform effects in carbuncle were obtained.

Dr. Frederick H. Baetjer, of Baltimore, said that in the treatment of thymic enlargement, cretinism may arise, and said that it was a difficult matter to calibrate the roentgen dose necessary to cure goitre or thymic tumors.

The new officers for 1915-1916 are:—

President: Dr. A. W. Crane, Kalamazoo, Mich.

1st Vice-President: Dr. Wm. B. Bowman, Los Angeles, Cal.

2nd Vice-President: Dr. Robert W. Gibbes, Columbia, S. Car.

Secretary: Dr. Willis F. Manges, Philadelphia.

Treasurer: Dr. Wm. A. Evans, Detroit.

New member of publication Committee: Dr. Geo. C. Johnston, Pittsburgh.

New member of Executive Committee: Dr. David R. Bowen, Philadelphia.

Adjacent to the meeting-room, several manufacturers had an exhibit of apparatus, tubes and plates. The meeting was attended by over one hundred members and probably one hundred and fifty guests.

Dr. Wm. L. Rodman, President of the American Medical Association, gave the principal address at the evening session, at which time Dr. Alfred L. Gray delivered his presidential address. Major Williams represented the United States Army. The sessions were well attended and the four days were barely sufficient to accommodate the many papers and discussions. The plate exhibit by members was extensive and excited great interest. It has not been determined as to where the next meeting will be held.

## BOOK REVIEWS.

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**STEREOROENTGENOGRAPHY OF THE ALIMENTARY TRACT.** By James T. Case. In Four Parts. Troy, N. Y.: The Southworth Company. 1915.

This publication is undoubtedly the most beautiful roentgen production extant. It is at the same time most practical. There are four volumes containing 100 stereoscopic roentgen illustrations and two hundred and three printed pages. These illustrations are actual photographic reductions from the original plates, which bring out the sharpness of detail far better than lithographic cuts. The publishers cannot be too highly commended for the mechanical and photographic excellence of these handsome volumes.

Each one of the illustrations is accompanied by a careful analysis of the case together with the operative findings. The author has had a unique opportunity for the preoperative and postoperative roentgen study of a large gastro-intestinal service. Aside from being the organizer and chief of an elaborate roentgen laboratory, he is also the assistant surgeon of the institution. The advantages of such a close connection between the roentgen and operative departments is reflected in the excellence of this stereo-clinic. In his roentgen clinic, Dr. Case does not pursue a dogmatic or arbitrary scheme of gastro-intestinal roentgenology, but chooses to take advantage of the fluoroscopic study of each case and records his findings upon plates by the stereoscopic method (which this publication illustrates) and by serial and cinematic roentgenography. "In fact (the author states), I consider the fluoroscopic examination of greater value than ordinary roentgenographic or stereoroentgenographic method, familiarity with the interpretation of the stereoroentgenographic images serving, however, to make more clear the ordinary fluoroscopic screen readings."

Volume I contains chapters upon Stereoroentgenography; The Stereoscope; Vertical and Horizontal Roentgenoscopes; The Coolidge Tube; Opaque Meals and Their Preparation. Then follow nine stereoroentgenograms of esophageal pathology, including diverticula, cardiospasm, aneurysmal stenosis, carcinoma, etc. Nine stereoroentgenograms with abundant text serve to illustrate the normal stomach in 5 cases of gastric ulcer.

Volume II contains twenty-seven stereoroentgenograms with excellent case histories and discussions of the roentgen and operative findings. This entire volume is upon the gross pathological changes in the stomach and duodenal bulb. There are 12 cases of gastric cancer; 3 cases of cholelithiasis; 4 cases of penetrating gastric ulcer; two duodenal ulcers; tubercular gastric ulcer; diaphragmatic hernia; subphrenic abscess.

Volume III contains twenty-five stereoroentgenograms, the first ten of which illustrate small intestine pathology such as acute and chronic obstruction, ileal stasis and ileocecal valve incompetency. The fifteen remaining reproductions are of the cecum and ascending colon. Cecum mobile, Jackson's membrane, carcinoma, retrocecal appendices, and an interesting case of a hemostat free in peritoneal cavity.

Volume IV rounds out the one hundred stereoroentgenograms and illustrates many atypical abdominal cases, several postoperative studies, and aberrant sigmoides.

Thus it will be noticed that the scope of the clinical material in this book is remarkable. At the same time the author has discussed in the text the whole field of gastro-intestinal roentgenology, adding line drawings to elucidate more strikingly.

We recommend this wonderful publication most heartily. It is the highest type of roentgen literature, and American Roentgenology can point with pride to this surpassing publication of Dr. Case.

**THE DIAGNOSIS AND TREATMENT OF DIGESTIVE DISEASES.** A Practical Treatise for Students and Practitioners of Medicine. By George M. Niles, M. D., Professor of Gastroenterology and Clinical Medicine, Atlanta Medical College, etc. etc. With 1 Colored Plate and 86 Other Illustrations. Philadelphia: P. Blakiston's Son and Company. 1915. Price, \$5.00.

Dr. Niles is professor of clinical medicine and gastroenterology in the Atlanta Medical College, and has been known to the readers of current medical literature for some years.



This book is divided into two parts, the first of 351 pages being on general diagnosis and treatment, and the second of less than 200 pages on a systematic consideration of the subject.

A special commendation can be made of the very easy and colloquial style in which the book is written. It makes interesting reading, and exhibits a pleasing personality behind it. In this, too, it is a marked contrast to so very much medical writing in America, which in aping the severe classical German style of scientific writing has in most instances succeeded only in squeezing out every drop of desire one might have in reading for reading's sake, and left it about as interesting as the report of a geological survey. Inasmuch as this habit has become the most aggravated in the highest places, such as the Rockefeller Institute, Harvard, Johns Hopkins, the University of Pennsylvania and Columbia, it is the more welcome to find Dr. Niles writing as if he were talking in his library instead of spouting a speech from the top of a monument.

He has also, to show that it is not impossible to combine the two, given very full and good expositions of all the modern means of diagnosing and treating gastric and intestinal complaints. The first part of the book dealing with the use of the *x*-ray, chemical tests, feces examination, the use of the stomach tube, dietary regime and drugs, is better than the second part. However, in the chapter entitled "Is the case strictly surgical?" we believe Dr. Niles exhibits some prejudices (which are really biologic defence-reactions) common to all gastrologists.

**X-RAYS: HOW TO PRODUCE AND INTERPRET THEM.** By Harold Mowat, M. D. Edin., Temporary Lieutenant, R. A. M. C.; At Present Officer to X-Ray Department Meerut Indian General Hospital, etc. etc. New York: Oxford University Press. 1915. Price, \$3.00.

The perusal of this book confirms the author's announcement that "this book is written for those who have little or no knowledge of the subject of *x*-rays. It has been the author's aim to state elementary facts in such a way, that the student or practitioner who reads the volume may be able, when he has finished, to feel that he has at least a good general idea of this branch of medicine."

The first third of the book discusses apparatus and is illustrated with catalogue cuts. Considering the size of the volume, entirely too much space is taken up with this discussion of apparatus and accessories. Then the author immediately offers a good chapter upon the localization of foreign bodies, a subject of unusual importance to English roentgenologists at the present time. The chapters upon the thorax and abdomen which follow are easy to read and would serve as an introduction to such subjects for beginners. The last third of the book is taken up by standard discussions of bone and joint lesions.

The illustrations are not up to the standard of American roentgenology, and the text appears to have been hurriedly prepared. Roentgenotherapy is not mentioned. The fact that the author is in medico-military service is sufficient excuse for the brevity of the text and the author's inability to demand more satisfactory cuts of his roentgenograms. Undoubtedly the second edition of this book will be eminently acceptable, for the author demonstrates his familiarity with modern efficient roentgenology.

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## EDITORIAL.

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### CHARLES DICKENS AND THE NATURAL EDUCATION OF THE CHILD.

Being a medical man of 'advanced' ideas you have no doubt been interested in child-nurture, and also in those innumerable books with the alluring titles which are variants of "What Every Boy Should Know" and "What Every Girl Should Know." No doubt books of this type have made a deep impression on you, not so much because you thought them exemplifications of wisdom, but because you thought it was your bounden duty to keep abreast of the times. Like all 'advanced' physicians you were appealed to by the anxious mother who had recently read these books and had but partially digested them. And in your modern rôle of medical adviser you were compelled to give forth knowledge which you knew was very poor stuff, but absolutely necessary to win the good opinion of the anxious mother. How greatly your contributions to her store of knowledge were misconstrued was no concern of yours, for your one idea was to retain her good opinion of you so that her name should not be obliterated from your roster of prominent patients. This ambition cannot be condemned, for the physician who nowadays makes light of his patients' thirst for knowledge, especially as to sexual matters, does so at the expense of the number of his patients. But where the wrong comes in is that he uses no discrimination in the matter of telling the anxious mother that she has read the wrong books and that it were much better for her peace of mind and also for the education of the child to read the right ones. Of course, even though he be 'advanced,' he may not always be well read; his readings, sad to relate, may oscillate only between popular sex books and one of the 'six best sellers,' and when called upon for information he may decry too bitterly the 'best seller' on account of its frivolities and the glossing over of moral lapses

and praise too highly the popular book on sex instruction for the young. And it is just because we feel that he ought to place the right books in the hands of the anxious mother, and because we feel that he has overlooked an author who was 'quite' well-known a decade or two ago, but who is somewhat neglected to-day, that we would impart to him the bit of knowledge that one Charles Dickens wrote in all his books just the sort of instruction every child should receive,—though it might be mentioned at once that no writer in the whole range of English literature was further divorced from sex instruction and the sex problems. But the instruction contained in these books shows beyond a doubt that the great author knew children much better than do the modern educators, be they of the rabid sex instruction type, or of what is to-day thought, by all those who have a place in the educational sun, as the old-fashioned type. Dickens is 'old' only in the sense that his great books on children—and all of his novels have a deal to do with the natural life of the child—were written 'many' years ago, as calculated by the breathless scavengers for the New who are so rampant to-day, and not because his writings are old-fashioned, hence useless. That we are not alone in our opinion of the superiority of Dickens' novels over the books recommended by the modern physician and educator for the 'higher education' of the anxious mother, so that she may see her children grow into manhood and womanhood with clean brains and clean bodies, we are printing below, with but few deletions, the exceptionally well-written and brilliant essay on "Dickens"\* by John Cowper Powys.

"It is absurd, of course, to think that it is necessary to 'hold a brief' for Dickens. But sometimes, when one comes across charming and exquisite people who 'cannot read him,' one is tempted to give one's personal appreciation that kind of form.

"Dickens is one of the great artists of the world, and he is so, in spite of the fact that in certain spheres, in the sphere of Sex, for instance, or the sphere of Philosophy, he is such a hopeless conventionalist. It is because we are at this hour so preoccupied with Sex, in our desire to readjust the conventions of Society and Morality towards it, that a great artist, who simply leaves it out altogether or treats it with a mixture of the conventionality of the preacher and the worst foolishness of the crowd, is an artist whose appeal is seriously handicapped.

"Yet, given this 'lacuna,' this amazing 'gap' in his work, a deprivation much more serious than his want of 'philosophy,' Dickens is a writer of colossal genius, whose originality and vision puts all our modern 'literateurs' to shame. One feels this directly one opens any volume of his. Only a great creative genius could so dominate, for instance, his mere 'illustrators,' as to mesmerize them completely into his manner. And certainly his illustrators are *drugged* with the Dickens atmosphere. Those hideous-lovely

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\*Visions and Revisions. New York: G. Arnold Snow. 1915.



persons, whose legs and arms are so thin that it is impossible to suppose they ever removed their clothes; do they not strut and leer and ogle and grin and stagger and weep, in the very style of their author?

"Remembering my 'brief,' and the sort of jury, among my friends, I have to persuade, I am not inclined in this sketch to launch out into panegyrics upon Mr. Micawber and Mrs. Gamp and Mr. Pecksniff and Betsy Trotwood and Bill Sikes and Dick Swiveller and Bob Sawyer and Sam Weller and Mark Tapley and Old Scrooge. The mere mention of these names, which, to some, would suggest the music of the spheres, to others would suggest forced merriment, horrible Early Victorian sentiment, and that sort of hackneyed 'unction' of sly moral elders, which is youth's especial Hell. Much wiser were it, as it seems to me, to indicate what in Dickens—in his style, his method, his vision, his art—actually appeals to one particular mind. I think it is to be found in his childlike Imagination. Now, the modern cult for children has reached such fantastic limits that one has to be very careful when one uses that word. But Dickens is childlike, not as Oscar Wilde—that Uranian Baby—or as Paul Verlaine—that little 'pet lamb' of God—felt themselves to be childlike, or as the artificial-minded Robert Louis Stevenson fooled his followers into thinking him. He is really and truly childlike. His imagination and vision are literally the imagination and vision of children. We have not all played at Pirates and Buccaneers. We have not all dreamed of Treasure-Islands and Marooned sailors. We have not all 'believed in Fairies.' These rather tiresome and over-rung-upon aspects of children's fancies are, after all, very often nothing more than middle-aged people's damned affectations. The children's cult at the present day plays strange tricks.

"But Dickens, from beginning to end, has the real touch, the authentic reaction. How should actual and living children, persecuted by 'New Educational Methods,' glutted with toys, depraved by 'understanding sympathy,' and worn out by performances of 'Peter Pan,' believe—really and truly—in fairies any more? But, in spite of sentimental Child-worshippers, let us not hesitate to whisper: 'It doesn't matter in the least if they don't!' The 'enlightened' and cultivated mothers, who grow unhappy when they find their darlings cold to Titania and Oberon and to the more 'poetic' modern fairies, with the funny names, may rest in peace. If the house they inhabit and the street they inhabit be not sanitized and art-decorated beyond all human interest, they may let their little ones alone. They will dream their dreams. They will invent their games. They will talk to their shadows. They will blow kisses to the Moon. And all will go well with 'the Child in the House,' even if he has not so much as even heard of 'the Blue Bird'!

"If these uncomfortably 'childlike' people read Dickens, they would know how a child really does regard life, and perhaps they would be a little shocked. For it is by no means only the 'romantic' and 'aesthetic' side of things that appeals to children. They have their nightmares, poor imps, and such devils follow them as older people never dream of. Dickens knew all that, and in his books the thrill of the supernatural, as it hovers over chairs and tables and pots and pans, is never far away. It lurks, that repelling-

alluring Terror, in a thousand simple places. It moves in the darkness of very modern cupboards. It hides in the recesses of very modern cellars. It pounces out from the eaves of quite modern attics. It is there, halfway up the Staircase. It is there, halfway down the Passage. And God knows whither it comes or where it goes!

"To endow the little every-day objects that surround us—a certain picture in a certain light, a certain clock or stove in a certain shadow, a certain corner of the curtain when the wind moves it—with the fetish-magic of natural 'animism'; that is the real child-like trick, and that is what Dickens does. It is, of course, something not confined to people who are children in years. It is the old, sweet Witch-Hag, Mystery, that, sooner or later, has us all by the throat!

"And that is why, to me, Dickens is so great a writer. Since men have come to live so much in cities; since houses and streets and rooms and passages and windows and basements have come to mean more to them than fields and woods, it is essential that 'the Old Man covered with a Mantle,' the Ancient of Ancients, the Disturber of Rational Dreams, should move into the town, too, and mutter and murmur in its shadows!

"How hard a thing is it, to put into words the strange attraction and the strange terror which the dwellings of mortal men have the power of exciting! To drift at nightfall into an unknown town, and wander through its less frequented ways, and peep into its dark, empty churches, and listen to the wind in the stunted trees that grow by its Prison, and watch some flickering particular light high up in some tall house—the light of a harlot, a priest, an artist, a murderer—surely there is no imaginative experience equal to this! Then, the things one sees, by chance, by accident, through half-open doors and shutter-chinks and behind lifted curtains! Verily the ways of men upon earth are past finding out, and their madness beyond interpretation!

"It is not only children—and yet it is children most of all—who get the sense, in a weird, sudden flash, of the demonic life of inanimate things. Why are our houses so full of things that one had better not look at, things that, like the face of Salome, had better be seen in mirrors, and things that must be forbidden to look at us? The houses of mortal men are strange places. They are sepulchres and cemeteries. Dungeons are they, and prison cells. Not one of them but have murderous feet going up and down. Not one of them but have ravisher's hands, fumbling, back and forth, along the walls. For the secret wishes, and starved desires, and mad cravings, and furious revolts, of the hearts of men and women, living together decently in their 'homes,' grow by degrees palpable and real and gather to themselves strange shapes.

"No writer who has ever lived can touch Dickens in indicating this sort of familiar sorcery and the secret of its terror. For it is children, more than any, who are conscious how 'haunted' all manner of places and things are. And people themselves! The searching psychologists are led singularly astray. They peer and pry and repine, and all the while the real essence of the figure lies in its momentary expression—in its most superficial gesture.

"Dickens' world is a world of gnomes and hob-goblins, of ghouls

and of laughing angels. The realist of the Thackeray School finds nothing but monstrous exaggeration here—and fantastic mummary. If he were right, pardieu! If his sleek 'reality' were all that there was—'alarum!' We were indeed 'betrayed'! But no; the children are right. Dickens is right. Neither 'realist' or 'psychologist' hits the mark, when it comes to the true diablerie of living people. There is something more whimsical, more capricious, more *unreal*, than philosophers suppose about this human pantomime. People are actually—as every child knows—much worse and much better than they 'ought' to be. And, as every child knows, too, they tune their souls up to the pitch of their 'masks.' The surface of things is the heart of things; and the protruded goblin-tongue, the wagged head, the groping fingers, the shuffling step, are just as significant of the mad play-motif as any hidden thoughts. People *think* with their bodies, and their looks and gestures; nay! their very garments are words, tones, whispers, in their general Confession.

"The world of Dickens' fantastic creations is all the nearer to the truth of our life because it is so arbitrary and 'impossible.' He seems to go backwards and forwards with a torch, throwing knobs, jags, wrinkles, corrugations, protuberancies, cavities, horns, and snouts into terrifying illumination. But we are like that! That is what we actually are. That is how the Pillar of Fire sees us. Then, again, are we to limit our interest, as these modern writers do, to the beautiful people or the interesting people or the gross, emphatic people. Dickens is never more childlike than when he draws us, wonderingly and confidingly, to the stark knees of a Mrs. Pipchin, or when he drives us away, in unaccountable panic-terror, from the rattling jet-beads of a Miss Murdstone.

"Think of the vast, queer, dim-lighted world wherein live and move all those funny, dusty, attenuated, heart-breaking figures, of such as wear the form of women—and yet may never know 'love'! It is wonderful—when you think of it—how much of absorbing interest is left in life, when you have eliminated 'sex,' suppressed 'psychology,' and left philosophy out! Then appear all those queer attractions and repulsions which are purely superficial, and even material, and yet which are so dominant. Mother of God! How unnecessary to bring in Fairies and Blue Birds, when the solemnity of some little seamstress and her sorceress hands, and the quaint knotting of her poor whisp of hair, would be enough to keep a child staring and dreaming for hours upon hours.

"Life in a great city is like life in an enchanted forest. One never knows what hideous ogre or what exquisite hamadryad one may encounter. And the little ways of all one's scrabbling and burrowing and chuckling and nodding and winking house-mates! To go through the world expecting adventures is to find them sooner or later. But one need only cross one's threshold to find one adventure—the adventure of a new, unknown fellow-creature, full of suspicion, full of cloudy malice, full of secretive dreams, and yet ready to respond—poor devil—to a certain kind of signal!

"Long reading of Dickens' books, like long living with children, gives one a wholesome dread of cynicism and flippancy. Children's games are more serious than young men's love affairs, and they must be treated so. It is not exactly that life is to be 'taken seriously.' It is to be taken for what it is—an extraordinary Pantomime. The people who will not laugh with Pierrot because his jokes are so silly, and the people who will not cry with Columbine



because her legs are so thin, may be shrewd psychologists and fastidious artists—but, God help them! they are not in the game.

"The romance of city-life is one thing. The romance of a particular city leads us further. Dickens has managed to get the inner identity of London; what is permanent in it; what can be found nowhere else; as not even Balzac got hold of Paris. London is terrible and ghastly. One knows that; but the wretched of its 'gamins' knows that it is something else also. More than any place on earth it seems to have that weight, that mass, that depth, that four-square solidity, which reassures and comforts, in the midst of the illusions of life. It descends so far, with its huge human foundations, that it gives one the impression of a monstrous concrete Base, sunk into eternity, upon which, for all its accumulated litter and débris, man will be able to build, perhaps has begun already to build, his Urbs Beata. And Dickens entered with dramatic clairvoyance into every secret of this Titanic mystery. He knew its wharfs, its bridges, its viaducts, its alleys, its dens, its parks, its squares, its churches, its morgues, its circuses, its prisons, its hospitals, and its mad-houses. And as the human atoms of that fantastic, gesticulating, weeping, grinning crowd of his dance their crazy 'Carmagnole,' we cannot but feel that somehow we *must* gather strength and friendliness enough to applaud such a tremendous Performance.

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"After all, it is meet and right that there should be one great author, undistracted by psychology—unseduced by eroticism. There remain a few quite important things to deal with, when these are removed! Birth, for instance—the mystery of birth—and the mystery of death. One never forgets death in reading Dickens. He has a thought, a pity, for those things that once were men and women, lying, with their six feet of earth upon them, in our English Churchyards, so horribly still, while the mask of their sorrow yields to the yet more terrible grin of our mortality's last jest.

"And to the last he is—like all children—the lover of Players. Every poor dog of Public Entertainer, from the Barrel-Organ man to him who pulls the ropes for Punch and Judy, has his unqualified devotion. The modern Stage may see strange revolutions, some of them by no means suitable to children—but we need not be alarmed. There will always remain the larger Stage, the stage of man's own Exits and Entrances; and there, at any rate, while Dickens is their 'Manager,' Pierrot may weep and dance, and Pierrette dance and weep, knowing that they will not be long without their audience, or long without their applause!

"He was a vulgar writer. Why not? England would not be England—and what would London be?—if we didn't have a touch, a smack, a sprinkling of that ingredient!

"He was a shameless sentimentalist. Why not? It is better to cry than to comb one's hair all day with an ivory comb.

"He was a monstrous melodramatist. Why not? To be born is a melodrama. To play 'hide-and-seek' with Death is a Melodrama. And some have found melodramatic satisfaction in letting themselves be caught. All the World's a Puppet-Show, and if the Big Showman jerks his wires so extravagantly, why should not the Little Showman do the same?"

P. S.

## ORIGINAL ARTICLES.

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### JOHN M. SYNGE: POET, PAGAN, PATIENT.

" . . . I saw you pass by underneath, in your crimson cloak, singing a song, and you standing out beyond your brothers are called the Flower of Ireland."—*Deirdre of the Sorrows*.

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By ARTHUR C. JACOBSON, M. D., of Brooklyn, N. Y.

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#### I.

The supreme genius of the Irish Renaissance was born in a suburb of Dublin, April 16th, 1871. Synge's boyhood was spent partly in beautiful, haunting Wicklow, among the strange people of the glens. In that enchanted region the sounds of Nature, to this Gael in spirit, if not in blood, seemed like the voice echoes of an invisible race. From the first, Synge was fascinated by the beauties of the Irish peasant idiom out of which he was later to weave his tremendous dramas. While at Trinity College, of which he was a graduate, he studied music and obtained a scholarship in harmony and counterpoint at the Royal Irish Academy of Music in 1891. In 1894 he went to Coblenz, Darmstadt and Würzburg to perfect his technical knowledge of harmony, for he had thoughts at this time of applying his music in a professional way. He was an accomplished pianist, violinist and flutist. Like Sidney Lanier, his musical talents undoubtedly influenced his poetical genius in its technical expressions, which reminds one of Walter Pater's contention that all arts have a tendency to verge towards, and finally merge in, music. At this time he wandered along the Rhine and through France, fraternizing intimately with the peasants, sleeping in the open and listening to the stories told in the Harz and Bavarian woods. For serious occupation, Synge translated the medieval lyrics of Walther von der Vogelweide into the Anglo-Irish dialect. He was also something of a painter. So his versatile creative impulses arose from the depths of an essentially esthetic temperament.

The vagabond, tiring of fiddling for sailors and peasants, became about 1897 the artist in Paris whom W. B. Yeats, distinguished poet and organizer of the Irish Literary Theatre in 1889, and of the Abbey Theatre of Dublin in 1904, found studying criticism, that is to say, "brooding over methods of expression, or ways of looking

upon life, which come, not out of life, but out of literature." Yeats, with uncanny insight, made an accurate diagnosis of the case, and advised Synge to go to the Aran Islands, at the entrance of Galway Bay, there to study the primitive, patriarchal people, the last remnant in modern Ireland of the ancient Gael, unspoiled by what we call, more or less euphemistically, civilization. Yeats divined the exact nature of the man's peculiar and mighty genius, and knew just how to turn it to healthy use. Surely such insight is as valuable for the race as genius itself, and the world owes Yeats a debt for this as for his own great art.

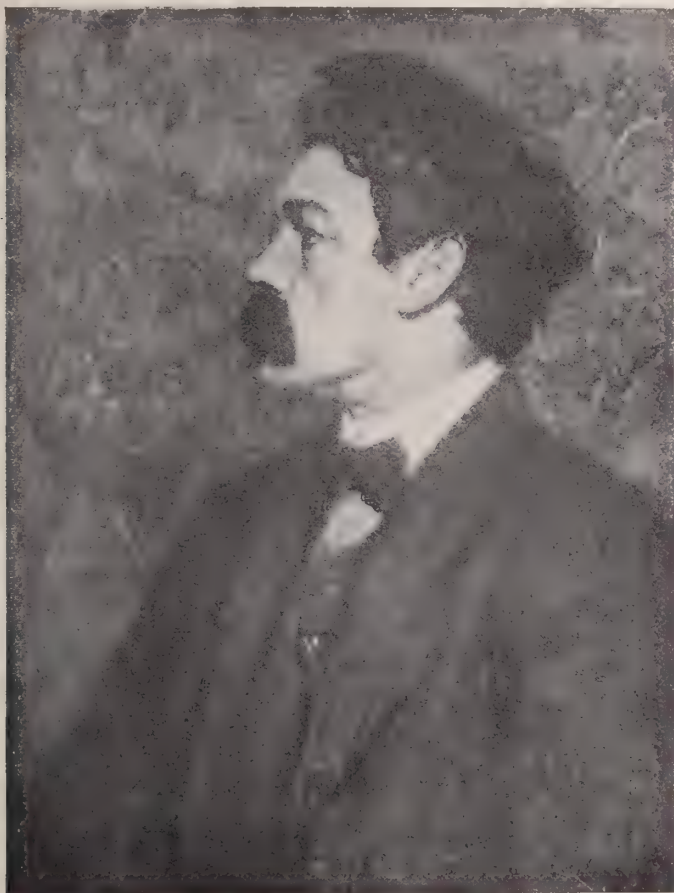
As a boy, rambling over the Wicklow mountains, Synge became quite an amateur naturalist, and then first developed the intense love of nature which so strongly marked his temperament. This Gaelic characteristic was intensified by his wanderings over Europe and his rough life in the Aran Islands. The startling economy of words with which he suggests natural appearances is uncanny. This pagan feeling of Synge's for beauty is correlative with that of the ancient Gaels which suggested the pre-Christian Paradise—a place to which we hope all true artists still go after translation.

While engaged in discovering modern Ireland and recovering ancient Ireland for himself and for us, Synge lived in a world of the imagination peopled by fairies whose power Christianity had elsewhere thrown off. In the Aran Islands one may, if he will, commune with the "kindly spirits that ride the air" about us, and apprehend a little in their enchanted atmosphere ancient Ireland's glamour of romance and mystery. Synge sensed fully the magic of Celtic lore in this environment—that "magic of fire and of tears," and entered keenly and understandingly into the life of the Aran peasants. The psychology of these pure Celts presents curious racial idiosyncrasies. Apparently because of the ardor of unsatisfied cravings which obsess them they find their most joyful moods and their most poignant griefs in the life beyond actuality, the life of the imagination—which, says Maurice Bourgeois, in an Irish mind is apt to become the more real life of the two. It is easy to see the bearing of this upon the Celt's religious proclivities and his response to the appeal of liturgy; and it has enabled the Irish better to withstand oppression, exploitation and poverty. The Celtic temperament is characterized by a strong tendency to react against the despotism of facts; by it illusions are cherished; the natural and the supernatural interchange closely; moods of rapture and dismay easily alternate. The facilitation of such mechanisms by alcohol (the bibulous Gael undoubtedly gets more concentrated joy out of the cup that inebriates, and penetrates farther into the realms of fancy—and of moral peril—under its influence, than any other human) and by the hectic stimulation of tuberculous toxins is matter of common observation. One may see these effects every day in the



commonplace Celt (if there is a commonplace Celt). In the genius one looks for an influencing of artistic products in strange ways. That Synge may have been influenced by the latter of these factors we think, for reasons which we shall presently set forth, more than probable.

Synge's interest in linguistics had taken him to Italy in 1896.



*Your cordial*

*J. M. Synge*

From an oil painting by James Paterson, R.S.A. (1913)

We mention the fact because his gift for languages must be definitely reckoned with in considering the man's achievements. When in the Aran Islands at varying periods between 1898 and 1902, he

studied and took notes constantly on the peasant dialect, making his sojourn agreeable with his fiddle, conjuring tricks, camera, and his natural genius for companionship. While the men and women of the Irish literary movement were endeavoring to revive the old Gaelic language, ignorant, as many confess themselves to have been, of the beauty of contemporary dialects, Synge was discovering and mastering a medium through which he was to address and delight the world of art. The "flamboyant imaginativeness" of the language of the peasants representing the last trace of primal society in the complex civilization of the British Isles enthralled the dramatist in the making. There are whole passages of prose poetry in Synge's plays which are literal transcriptions of the ordinary language of these people. The musical phrases in "Deirdre," swinging, as some critic has aptly said, like the chant of wind and wave, are all in this language. The vocabulary of the average Irish peasant, unable to read or write, is at least three thousand words, whereas that of the English peasant is from three hundred to five hundred words. Startlingly bold metaphors are notable. The 'flaming' language of the "Playboy" is made up wholly of peasant vocabulary, and is a dialect largely moulded by the native Erse. It is to some extent an Elizabethan English that the peasant employs, which remained more or less fixed in his case while the 'evolution' of British speech proceeded, which partly explains its peculiar adequacy as a medium for the exchange of thought (the brogue is distinctly Elizabethan). Thus the style and the stage speech that are Synge's, and that "for the first time ennoble English prose drama as blank verse has long ennobled English verse drama," derive from peasant sources; their energy and beauty, and the greatness and universality of the themes of all the Plays, with the exception of "The Tinker's Wedding," reveal Synge as a Titan of Shakespearean order. What he wrote appeals and will always appeal to all men, not to any class. He has justly been called the greatest imaginative dramatist who has written English since Shakespeare. He fitted into the Irish Revival, says Lowther, like the Renaissance painters possessed with a glowing sense of the earth's beauty. The creative phase of his artistic life covered only four or five years, and he simply happened to find in Dublin a stage to produce his plays. Because of his genius no such contradiction in terms as an Irish National Theatre, presenting wholly English works, developed. While caught up in the Celtic Renaissance, he was nevertheless absolutely independent artistically. He never became a Yeatsian mystic. Synge was too much of a realist for that, despite the spell of the fairies, to which he was not oblivious. He did not regard the theatre as a place for dramatic didacticism; he had no message; 'movements' and 'schools' were loathed by him. He repudiated ethical and sociological problem-plays. In short, he was an artist, concerned

only with life itself. Yeats cannot imagine him anxious to impress or convince. He had but one *visible* strength, says this friend, the strength to reject from life and thought all that would mar his work, or deafen him in the doing of it. Yeats says that he had no obvious ideals or sentimentalism. He pronounces no judgment. "The emotional generalization of beauty" was his chief object. Nothing rhetorical, conventional, pedantic, timid or inhibitory of natural impulse will be found in his works. For the dramas of reform and dialectics and for that of decadent culture he had no sympathy, since they are the dramas of this or that class, and Synge was detached from all classes. "We are prone to think about life," says Bickley, "instead of living it, so that our artists are prone to deal with special problems rather than with life as a whole, and our language has deteriorated from the level of art to the level of journalism." Synge conceived of art as an expression of life "superb and wild," or as something so imaginative as to enable us to "escape from life," in which latter design one may discern working in the artist the Celtic idiosyncrasy already discussed. The drama, like the symphony, must not teach or prove anything, if it is to be reckoned as art, but above all things it must not lack humor—an essential nutrient of imagination. "Only that which does not teach, which does not cry out, which does not persuade, which does not condescend, which does not explain, is irresistible. . . . All art is the disengaging of a soul from place and history. . . . To speak of one's emotions without fear or moral ambition, to come out from under the shadow of other men's minds, to be utterly one's self, that is all the Muses care for." So in Synge there is little but beauty and power—"Interpretations so removed from the actualities of the rough-and-tumble of commercial civilization as to have all the remoteness of classical tragedy, yet modern in spirit."

It was the ancient Celtic dreamland that lured Synge. He was interested in the peasantry only in so far as they represented a survival of paganism. Synge himself was a pagan set down into modern Ireland, not by angels, but by the gods—a pagan plus the culture, but not the religion, of modern civilization. We are by no means speaking of his paganism reproachfully. The pagan Irish were a heroic and highly cultured people, and the Irish literary artist is repeatedly driven back into the "dateless dreamworld" of the ancient sagas. From an artistic standpoint Hibernian paganism is by far the most interesting phase of Irish social history. We do not have to go as far as Michael Monahan, when he declares moral partisans and casuists the plague of Ireland, to comprehend that certain phases of the country's religious discipline do restrain artistically a people naturally fanciful, imaginative, fiery and passionate, its creative energies sublimating largely into spiritual and contemplative 'activities.' The qualities that make



for art apparently war against tradition and the settled things of life, and Monahan speaks truly when he declares that the attitude of the great majority in Ireland is against experiments in art that seemingly involve any cleavage with "things settled for good and all." Mysteries must remain mysteries; they must not be solved. It is in the light of these facts that we should look for an explanation of the resistance to the Irish Renaissance and the fierce resentments inspired by such creations as the "Playboy of the Western World," although here one must also bear in mind the Irish Gael's traditional habit of disparaging his successful fellows. These things are chargeable to the Irish people and not to their faith, for while evangelical Protestantism and the Puritanism that it engendered throttled art, Catholicism as such has always been compatible with it.

Synge's inherent Neo-Paganism, his observation of life from an exclusively artistic standpoint, his complete freedom from opinions and philosophic generalizations (Masefield says Synge was the only Irishman he ever met who cared nothing for political issues—a man of no opinions in an opinion-ridden country), his ability to overlook Christianity in the Irish peasantry, his just estimate of the literary and musical values, by other artists unsuspected or unapplied, of that peasantry's suave and subtle speech cadences and bold metaphoric expressions, and his mastery of the unspoiled Gael's verbal resources whereby effects of "flaming richness" are achieved, sometimes with an amazing economy of language, sometimes with a full recourse to the large vocabulary—all these things help partially to account for Synge. We can never account fully for genius, except as a gift of the gods. The occasional attempts to posit disease as accounting for genius try one's intellectual patience severely. Disease may affect the psychological switchboard and color thereby the product of creative genius, but it can in no way account for the most transcendent of human endowments.

Through his genius Synge "lifts his characters from their provinciality into a universal world, making them representative of human nature everywhere." Ignoring dramatic rules and triumphing over them (the "Playboy" is comedy, tragedy, satire and poem all in one), he omitted nothing essential in life from his six short plays. Complete master of his rhythmic prose medium, rebel against "ready-made art creeds and literary industrialism," his artistic idiosyncrasy discerned the pagan "on whose old-time heathendom has been artificially and superficially grafted the Christian faith," and through him he looked and saw and limned pre-Christian Ireland and its Elysium, the Tir-na-nOg. Be it understood that he was not a scoffer, but "only an artist." His attitude was simply non-religious. Such an ugly thing as sectarian bias he did not even understand.

It is significant that Synge's women are superior to his men—for example, Deirdre and Pegeen. The Irish civilization before Saint Patrick gave women a high social status. Even a female priesthood was recognized. The Brehon Laws of ancient Gaeldom show this high status, and there is no better way to judge a nation than by its treatment of women. Synge always thought of women as taking the initiative in love-making, which in itself marks him apart from the conventional male and his social arrangements posited upon woman's implied inferiority.

Synge's sardonic humor has been declared not exactly Irish. It has an ironical brooding element in it. It is not amiable, but harsh and bitter and deep in its implications. It is considered unique by some critics. A typical example of Synge's humor is found in an unfinished play of his recalling in theme Shakespeare's "*Cymbeline*," in which a sea-captain boasts of his wife's fidelity; then follows an attempted seduction, in resisting which the lady idolizes her husband, the sea-captain, so much that she can no longer put up with him when he actually comes back. Another good specimen is afforded by a scenario in which, during the Rebellion of '98, two women, a Protestant and a Catholic, are supposed to take refuge in a cave, where they quarrel about religion, abusing the Pope or Queen Elizabeth and Henry VIII, but in low voices, for the one fears to be ravished by the soldiers, the other by the rebels.

## II.

Synge wrote six plays, two very short. He was well advanced on another at the time of his death. The four small volumes of his works contain the plays, the few poems and translations (Petrarch, Villon, Leopardi, Walther von der Vogelweide), miscellaneous writings on Irish peasant folk, and the book on the Aran Islands. His work was not quite complete at the time of his death—he was planning an Irish version of the "*Imitation of Christ*," revising "*Deirdre*," and experimenting in the creation of a new form: blank verse in dialect. He also had in mind at this time the writing of a play on Dublin slum life, which he had closely studied. In the hospital shortly before his death he declared he had "still more than one playboy in his belly." Nevertheless his dramatic writings were substantially finished and stand as a "self-consistent body of work" in the most difficult department of literature. We know that he felt that he had practically exhausted the peasant theme. His stage technique is simple and one of the chief elements of the plays, accounting in part for their charm and impressiveness, is a kind of sombre, unexpressed mystery, usually evoked at the outset. The plays are imaginative expressions of life, totally devoid of propaganda, and so may be said to constitute a healthful reaction against the Shavian drama of endless discussion.

"The Tinker's Wedding" was the first drama conceived by Synge. Begun in 1902 and finished in 1906, it was produced at His Majesty's Theatre, November 11th, 1909 (after Synge's death). "In the Shadow of the Glen" and "Riders to the Sea" were finished by the winter of 1902-3. The former was produced in Dublin, October 8th, 1903, the latter in the same place on February 25th, 1904. The Abbey Theatre opened in Dublin, December 27th, 1904, and on February 4th, 1905, "The Well of the Saints" was produced there. On January 26th, 1907, "The Playboy of the Western World" was put on. "Deirdre of the Sorrows" was staged January 13th, 1910.

"In the Shadow of the Glen" is a satire of loveless marriage. In it are pictured the yearnings of a woman living in solitude with her old and crabbed husband for the larger life, and her pathetic attempt to realize her ideals and aspirations by going off with a tramp, the frayed symbol of her dreams. In this play one is particularly struck by the beautiful speech cadences. To hear the Irish Players speak the lines of this play is a revelation of the musical possibilities of English. Maurice Bourgeois, in his criticism of this drama, uses very appositely, as terms descriptive of some of its parts, organ voluntary, symphony and nocturne.

"Riders to the Sea" leaves the critic dumb. It is beyond criticism. It is as flawless as "Hamlet" or the "Agamemnon." It has been called the most imaginative of plays and the greatest tragedy of modern times. An elegiac, breathless masterpiece, it depicts the tragic elements in the lives of fisherfolk, the dread of the sea and yet the sense of inevitable doom—distinctly pagan fatalism, says Bourgeois. Synge's own paganism must have made the creation of this classic peculiarity congruous. In it there is no faith or hope. Synge was more pagan than even the Irish of the Island of Inishmaan, of whom it has been said that they used to be re-converted by the saints ever day and were pagans again by the morning.

"The Well of the Saints" is thought by many to be Synge's most perfect achievement. It deals on the highest artistic level with the tendency of the Celtic temperament to escape from actuality into a world of dreams. For sheer beauty, simplicity and pathos this play can hardly be matched. Two blind beggars, husband and wife, have created a world of imagination in which they fancy each other to be beautiful. Their sight is miraculously restored by a wandering friar and their ugly persons and the actual world revealed to them, their enchanted world vanishing. Finally, however, they lose sight again, whereupon the saint offers to heal them anew, but they are happy in their old world of dreams and dash the holy water from the friar's hand.

The "Playboy," declares George Moore, is to Ireland what "Don Quixote" is to Spain. He thinks it the most significant play of the last two hundred years. It deals masterfully with the "dreaminess



and imaginative exuberance" of the Celt, and with his "puzzling combination of mysticism and practicality." It is doubtful if the language of love in this play can be equaled in the whole realm of literature for imaginative beauty. When this great work of art was first produced in Ireland and America it aroused the keenest resentment because of its supposed reflections upon Irish womanhood, yet it is a familiar fact that the conventional stage Irishman, a most offensive travesty, was long accepted with apparent delight. In this play it is very cleverly shown that even in love-making the Celt prefers the dream to reality. Instead of putting their love into some sort of action, the lovers draw ravishing word pictures of what they will do at some future time.

In "Deirdre," Synge went wholly back to ancient Gaeldom and sang his swan song in an imaginative atmosphere most consistent with his artistic powers and intellectual interests. Not to found a drama or a poem upon the Irish Helen would be a strange oversight indeed in an Irish artist, for she has been the theme of themes with the whole tribe of Celtic writers. Synge in this work puts fully upon us the spell of the old dreamland, and, on a more heroic scale than in "The Shadow of the Glen," shows us the soul of a woman in revolt, sacrificing kingdom and life for the love chosen in defiance of those who would impose its counterfeit upon her, and meeting death exultingly as a paltry penalty to pay for the triumphant joys and sweet experiences of her tragic romance—the first of feminists and the only type of woman with whom great art can profitably concern itself.

The poems proper are grim, pessimistic, *brutal*. Nature and the peasant folk inspire them. The undercurrent of sadness is largely accountable by reason of the fact that many of the poems were written during his last illness, the very thin volume containing them passing through the press while he lay dying. He was rather hard put to it to make the volume "less thin" than it promised to be, and it was for this reason that the translations were included with the poems. The judgment of Maurice Bourgeois with respect to the poems is sound, namely, that they are merely a by-product. The translations are accounted incomparable of their kind.

### III.

What blindness did for Homer, lameness for Hephæstus, asceticism for any saint you will, bad health did for Synge and his noble art, says Yeats. When such a disease as tuberculosis, with its curious hectic excitation of the faculties, takes a genius out of the grind of modern life, which, declares Yeats, destroys the arts, then one may indeed look for uncommon results. Now what are the facts about Synge? His health was always very delicate. He was obliged to leave school when about fourteen years of age. The hardships of

his vagabond life in Europe, the Aran Islands and West Kerry probably impaired his health further. Life lived in the open in Thoreau fashion invites tuberculosis, as in fact happened in the case of that New England celebrity. Synge was of low vitality always, and never attained robustness, though a manlier man never walked the earth. He is said not to have looked strong, his face being pale, drawn, seamed and old-looking. We are told by one friend that he was neither weakly nor robustly made. One critic writes, significantly: "His was such an intense, supersensitive temperament that he naturally clutched at extreme types of existence with all the hectic greediness of a consumptive," and in another place we encounter: "He saw life and Irish life both with and through eyes that were diseased." In 1897, or about the time that Yeats discovered him living in poverty in Paris, and probably just before his first trip to the Aran Islands, he had an operation for the removal of enlarged glands in the neck. At this time he is said to have looked extremely delicate. His "Under Ether," a graphic description of his sensations when going under and in coming out of an anesthetic, was written at this time. His health in Paris had repeatedly given way, and there were serious breakdowns. Frequent attacks of 'influenza' are recorded. In January, 1903, we are told that he was very frail. In December, 1903, Synge wrote: "I was getting on well with the blind people ["Well of the Saints"], till about a month ago when I suddenly got ill with influenza and a nasty attack on my lung." In 1904 his health was giving way rapidly. In 1906 he was failing fast. Working bravely and fighting his ill health, we find him writing on February 15th, 1906: "I have been down for ten days with bronchitis. My lung is not touched, however, and I have got off well considering. I hope I shall be all right next week" [spes phthisica?]. About the same date he wrote: "If I do not get a good summer, I generally pay for it in the winter in extra bouts of influenza and all its miseries." On November 25th, 1906, he wrote: "I have had rather a worse attack than I expected when I wrote my last note, but I am much better now, and out as usual. One of my lungs, however, has been a little touched, so I shall have to be careful for a while" [writing the "Playboy"]. It was during this month that Synge found himself unable, because of hoarseness, to give a preliminary reading of the "Playboy" at a Dublin hotel, Mr. W. G. Fay taking his place. This hoarseness is remarked by various biographers as having been present over a very long period of Synge's later life, as was also cough. On January 26th, 1907, Synge wrote again: "I have a sort of second edition of influenza." The rioting which attended the production of the "Playboy" had a disastrous effect upon his fast failing health, and the last year became a struggle. He then worked upon "Deirdre," cheered by his fiancée, Miss Maire O'Neill, the talented actress who created Pegeen, in the

"Playboy." He knew for twelve months that he was dying, and in about one-third of his poems he sings of death. The whole creative phase of his artistic life covered only about five years, corresponding to the period of active disease, which has a definite bearing upon his precocious, fatalistic sense of human annihilation—the sense of the Greeks and his own pagan types—which we find so forcefully expressed in the "Riders to the Sea." But Synge's humor always saved him from morbidity.

"And so when all my little work is done  
They'll say I came in eighteen-seventy-one,  
And died in Dublin. What year will they write  
For my poor passage to the stall of night?"

Abdominal symptoms necessitated an exploratory operation early in 1908. This was done at the Elpis Private Hospital, in Lower Mount Street, Dublin, and he left the hospital for a time in May of that year. The surgeon had found that he could do nothing. For a time there was marked improvement, and Synge looked healthier and said he felt much better. Soon, however, he had to return to the hospital. On March 23rd, 1909, he was carried into a sunshiny room at his urgent request, for he wished to look once more upon the Dublin mountains. Sad to say, he was unable to see them, and wept. In the early morning of March 24th, 1909, Synge said to his nurse, "It's no use fighting death any longer," and then turned over and died. At the time of his death he was not quite thirty-eight years old.

The cause of Synge's death was entered in the General Register Office at Dublin as intestinal carcinoma. We are not aware whether this was a laboratory or an operating table diagnosis. In the light of Synge's clinical history, one would naturally think of abdominal tuberculosis, a conception which his improvement after exploratory laparotomy would tend to sustain. However, we have presented all available data, and the reader can draw his own conclusions. Cancer engrafted upon ulcer is quite possible without nullifying the tuberculous phase, which stands out definitely by itself. For some time before the abdominal condition compelled intervention, Synge suffered from internal pain suggestive of ulcer.

#### IV.

The special literary gifts of the Irish race are to see even greater realization than heretofore. The Lady Gregorys, the Bernard Shaws, the Wildes, the George Moores and the Yeatses have crystallized them on an amazingly large and brilliant scale of late, and in the increased creative impetus which art usually manifests after a war (Synge himself was born in the last year of the Franco-Prussian War) Ireland will surely share liberally, if she does not lead.



It was a discerning critic who recently expressed the opinion that perhaps the one appealing and genuine note in English literature of this time is the "voice of the Irish." The tremendous vitality behind that voice is shown in the fact that sixty plays by native writers were produced in the first eight years of the Abbey Theatre's existence, an unmatched record.

The Celtic poets frequently conceive of Ireland as an old woman transformed into glorious and beautiful youth, reborn of Irish hope—the Ireland that is seen by the eyes of Patrick, in Yeats's "Kathleen ni Houlihan":—

*Peter*:—"Did you see an old woman going down the path?"

*Patrick*:—"I did not; but I saw a young woman, and she had a walk like a queen."

115 Johnson Street.

## A GROUP OF CLINICAL CASES.

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AND

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We present herewith a somewhat miscellaneous group of cases, none of which perhaps is sufficiently dignified to be reported alone. They may however be of interest thus grouped, either because we have rather complete records of them or because we have had an opportunity to observe them over a period of time sufficiently long to make conclusions possible. They are the prize cases of a certain length of time and reports of such periods of work seem to us always valuable.

1. Carcinoma of the cervix, removed by vaginal hysterectomy, patient living and well five years later.
2. Course of a case of colloid carcinoma of the hepatic flexure of the colon.
3. Recurrent myositis ossificans traumatica.
4. Splenectomy for splenic anemia; blood reports for a year after.
5. Volkmann's contracture.
6. Paraplegia due to tumor of the spinal cord; operation; recovery.
7. Two cases of carcinoma of the penis.
8. Chronic intussusception.
9. Abnormal first rib simulating cervical rib.

In presenting these histories no attempt will be made to record a classical history, with paragraphs of family and personal history having no bearing on the case. We shall on the contrary endeavor to present the essential features of the case in as concise a manner as possible.

CASE I.—Carcinoma of the cervix. Vaginal hysterectomy. Patient alive five years after the operation. Woman, *æt.* forty-five; first presented herself for examination March 10th, 1910. She had had pain in the lower pelvis and uterine discharge for a period of one year, and had been refused operation by two men. The appearance of the cervix may be imagined from the photograph of it after removal (Fig. 1). Removal, of course, was done with faint hope of achieving any satisfactory result. The importunations of the patient had more to do with determining us to try removal than anything else. However, in looking back on this case, in the light of the fact that she is alive and well five years after the operation, it is worth noting that the history sheet, made out

at that time, states that the uterus was movable, and thus the conclusion was reached that there was no great amount of extension into the broad ligaments. This habit of determining whether the uterus is movable enough to permit a vaginal hysterectomy is one that thus was useful in arriving at conclusions in regard to the operability of a carcinoma of the uterus itself. This patient came into the office within the last two months and was in perfect health, doing her ordinary duties around her farm, with no pain and not the slightest indication of any metastasis or recurrence. Microscopically the growth is a squamous epithelioma. The interest in this case to us centers in the fact that a carcinoma of the uterus was operated with slight ideas of a permanent cure; it was operated by a method not well adapted for complete removal; and, furthermore, the method was determined on because the movability of the uterus



Fig. 1.—Squamous epithelioma of the cervix removed by vaginal hysterectomy.

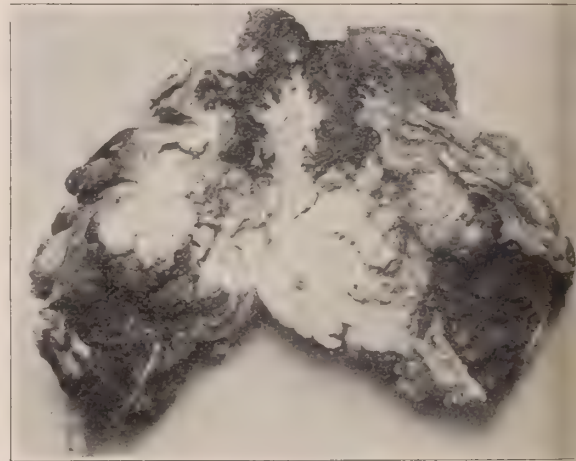


Fig. 2.—Colloid carcinoma of the hepatic flexure.

indicated that the vaginal route was possible; and that that very movability was an earnest of the fact that the operation would be successful.

CASE II.—Colloid carcinoma of the hepatic flexure of the colon. Three operations.

Fig. 2 is a photograph of the colon just below the hepatic flexure, split open so as to show a colloid carcinoma; the growth shows white in the cut and can be sharply demarcated from the darker appearing mucous membrane of the gut.

The patient from whom this specimen was obtained is a woman of thirty who had had a somewhat extended operative history before this growth was discovered. She was operated for dysmenorrhea in 1908, and the appendix removed by another surgeon. She first came under the care of one of us (Outland) in 1912 for a postoperative hernia; she was supposed to have a floating kidney, but at operation the right kidney was found to be in good position and was not disturbed.

Following this she was fairly comfortable until 1913, when she began to have, at intervals of a month or six weeks, peculiar attacks lasting for three or four



days, with coma, vomiting, no passage of gas or feces, and general prostration. Between attacks she was constipated, vague pain was complained of, all up the right side of the abdomen. No blood was found in the stool. Finally a lump was felt in the right side of the abdomen which at first was taken to be the old floating kidney.

In March, 1913, laparotomy revealed a mass at the hepatic flexure of the colon and colocolostomy was done.

In August, 1913, another laparotomy was made and the mass excised. The patient had done reasonably well in the meantime and without a recurrence of the old attack.

Since that time she had progressed favorably. At the present time (nearly two years after the final operation) she has some mild mechanical symptoms of an obstruction at times, which may be explained by the fact that the colo-

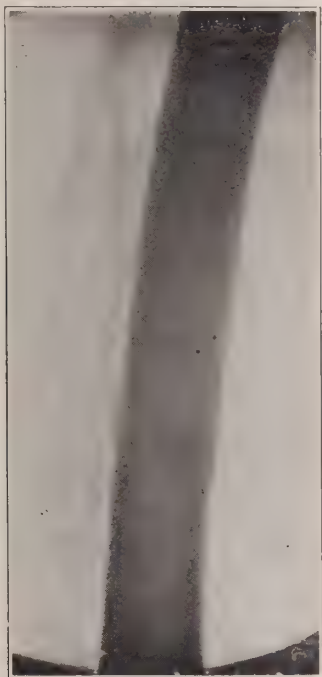


Fig. 3.—Myositis ossificans traumatica.



Fig. 4.—Myositis ossificans traumatica—recurrent.

colostomy opening is not always adequate and becomes jammed with feces. These symptoms appear in the form of attacks, constipation and a feeling of fullness up the right side of the abdomen. The possibility of the extension of the growth has been considered. If it has extended, we feel no responsibility rests on the operation, as the cut shows quite plainly that the excision was made so as to remove all of the growth.

CASE III.—Recurrent myositis ossificans traumatica. The patient is a young man of twenty-one whose vocation was student and whose avocation was playing on the football team of one of the largest universities in our vicinity. As happens so very often in such matters, his vocation did him no harm, but his avocation was the origin of a surgical operation.

In October, 1913, he received a direct blow of considerable severity on the anterior surface of the left thigh in a football game, and after a short period

of what was called 'Charley Horse' he noticed a hard swelling on the left thigh in front, which, after it had attained a few months' growth, extended from 3 in. below Poupart's ligament to within an inch of the patella. It did not allow him to flex the leg more than a few degrees, and was quite perceptible on observation as a long low tumor on the front of the thigh. Its consistency on palpation was hard.

The appearance of an x-ray picture taken on the 16th of December, 1913, is shown in Fig. 3. It was determined to postpone operation at this time in view of the fact that cases of myositis ossificans traumatica, which this one undoubtedly was, are prone to recur if the bony growth is removed before the process of ossification is complete. In order to allow this case to 'ripen' he was told to wait, and on the 11th of February, 1914, another x-ray showed, in the language of Dr. E. H. Skinner, who made the plates, "that the character of the bony process upon the thigh shows increasing density over the last plates. There is more uniform infiltration of the mass with lime salts, and the honey-combed appearance of the earlier negatives has developed into a dense bony mass."

It was determined then, on the 27th of February, 1914, to operate upon him, and on laying open the thigh and splitting the vastus muscle, enormous quantities of spongy bone deposit were evacuated. The size of this deposit when lumped together was roughly 10x3x2 in. It was found apparently not so much infiltrating the body of the muscles themselves as deposited between the various vasti muscles, that is to say, deposited between muscle-sheaths.

The patient made an uneventful recovery, and to everyone's surprise, played football again through the entire 1914 season.

On the 10th of February, 1915, however, the patient again presented himself with a condition practically precisely similar to the previous one. He has a hard tumor in the upper part of the left thigh, movable only as the muscles are movable when flaccid over the femur. The x-ray here reproduced (Fig. 4) shows undoubtedly a recurrence of the myositis ossificans, and the shadow cast by this growth is denser than either of the other two. It was deemed advisable for the patient to wait one or two years before trying to reoperate this case, in order to give the deposit plenty of time to 'ripen.'

CASE IV.—Splenic anemia, removal of the spleen. Reports of blood examination for a year after.

I. N., *æt.* fifteen, a high school student, was first seen in November, 1912, soon after an attack of copious bloody vomiting. She continued to vomit for a period of six weeks, vomiting sixteen times in that interval, often as much as a teacupful at a time. Before this she had had no serious illness. She came of healthy stock. She had never menstruated. About six months before the hematemesis, that is to say in May and June, 1912, she had a spell of tenderness and pain in the region of the spleen.

In February, 1913, she again vomited blood quite copiously over a period of two weeks. In the interval between November and February she had lost color and strength and passed tarry stools constantly. It was also noticeable on the most casual observation that the abdomen was growing larger. There is occasional pain over the left side of the abdomen.

On April 4th, 1913, physical examination showed an emaciated girl with lemon-colored skin and pale conjunctivæ and mucous membranes. Her temperature was 97.4° F., her pulse was 110, her blood-pressure 115. The heart's apex was in the nipple line with a systolic murmur at the apex. The lungs revealed nothing of importance.

*The Abdomen.*—A large tumor in the left side of the abdomen was, past all doubt, the spleen. It extended to three fingerbreadths below the umbilicus. The liver extended to two fingerbreadths below the costal arch. It was most

probably this hypertrophy which had caused the hematemesis, by engorgement of the veins at the cardiac end of the stomach. There was evidence of some fluid in the abdomen. The urine was free of any pathologic elements. The blood examination showed hemoglobin 20 per cent., red cells of 1,600,000 and whites of 4,000. There were no enucleated reds, no megaloblasts, but marked poikilocytosis and many macrocytes. The differential count of white cells showed large lymphocytes, 14 per cent.; small lymphocytes, 52 per cent. and polymorphonuclears, 34 per cent.

A Wassermann reaction was negative.

Under a diagnosis of splenic anemia, or, as it seems more conservative to call it, splenomegaly with anemia, the patient was operated April 15th, 1913, and a spleen measuring  $10\frac{1}{2} \times 5 \times 4$  in. was removed. The peritoneum was clear, some ascitic fluid escaped on opening the peritoneum. The liver was enlarged, and apparently somewhat cirrhotic. The spleen was adherent at several places to the peritoneum. A small accessory spleen, about the size of a peach stone, was on the splenic pedicle, and, owing to the condition of the patient, time was not taken for its removal. That fact is probably the most interesting single thing about the case.

The patient, after a few days, when it seemed as if her heart were incompetent, as evidenced by swelling of the ankles and rapid respiration, did remarkably well.

April 21st, hemoglobin was 45 per cent., whites 12,000, polymorphonuclears 62 per cent., reds 2,800,000 (one enucleated red to every four fields of the microscope).

May 1st she had no heart murmur, and was walking around her bedroom. The hemoglobin was 60 per cent. and the red cells 2,148,000; the whites 10,600; polymorphonuclears 51 per cent.

May 5th, hemoglobin 70 per cent., reds 3,526,000; whites 7,200.

May 21st, hemoglobin 80 per cent.; reds 4,500,000; whites 4,000. No blood in the stool.

June 21st, hemoglobin 80 per cent.; reds 3,800,000; whites 4,000.

September 1st, 1913, hemoglobin 85 per cent.; reds 5,000,000; whites 4,600.

March, 1914, hemoglobin 90-100 per cent.; reds 5,000,000; whites 8,000. She has gained in color and weight and is going to school again in good health.

This patient was heard from about a month ago and is in good health.

Microscopically the spleen was of the chronic hyperplastic type of splenic hypertrophy with anemia.

This history is typical of a large number of recent reports of splenectomy for this type of anemia. It seems now quite definitely established that in the presence of an anemia of the secondary type with an enlarged spleen, with or without a large liver, a splenectomy is a specifically curative procedure. So many cases of this kind are now reported that it seems superfluous to add any others to the list as single reports.

CASE V.—Volkman's contracture. This case is included here only because we have a good photograph of the arm, and because no result was obtained by lengthening the tendons.

Patient, female, *æ*t. eleven, presented August 28th, 1913, with this history: Four years ago she had a fracture of the right elbow. An x-ray picture of the fracture is not available. It was probable a fracture of the humerus at the olecranon process. The arm was splinted very tightly and the hand at this time was noticed to be dark and swollen. After the splint was taken off she found she could not move the fingers and that there was limitation of move-



ment at the elbow-joint. The condition of the arm and hand is best seen in Fig. 5.

It was thought that lengthening of the tendons on the palmar surface of the arm would relieve the situation, and this was accordingly done. The result, however, was far from satisfactory. It is hoped that at a later period an opportunity of shortening both bones in the forearm may be afforded us.

CASE VI.—Paraplegia due to tumor of the spinal cord. Laminectomy, removal of tumor; full recovery.

The history of this case is here given in the words of Dr. A. L. Skoog: First examination on April 22nd, 1913. Patient, *æt.* forty-three, has four living children, the youngest aged six; all healthy; one child died at the age of three with diphtheria. Never any miscarriages. Family history negative. Irish ancestry.

*Complaints.*—Weakness and numb feeling with pain in the lower extremities. Past History: Never any injury. Has had hemorrhoids since the birth of the first child, nineteen years ago. Has been subject to 'sick headache' for some years, otherwise her health has been good until the onset of the present illness. She lives on a farm where she has done some work, which usually falls to the lot of a farmer's wife. Present History: About six months ago there was an



Fig. 5.—Volkmann's contracture.

attack of numbness in the lower extremities. No heed was given this. The patient dates the onset of her weakness about March 1st, when she had definite numbness in the left ankle, which increased and crept upward reaching the hip in about three weeks. The patient states that she cannot well describe the numbness, which is of a vague type. She has had creeping cold and hot flashes in her leg. Not much pain present except when walking. This pain is less at the present time. The right leg was involved in a similar manner about two weeks later. There is now present a wide pressure zone as if a band was tightened around the waist and legs. Weakness appeared in the lower extremities about the same time. There has never been any incontinence of urine. There is often present a desire to urinate, and she must hasten to the toilet. Her ability to initiate micturition is decidedly lessened; has control of defecation but must frequently hasten to stool. During the past year she has missed a few menstrual periods.

*Examination.*—Present condition good; in good nutrition, no muscular atrophy; mental condition is excellent. There is no stigma of a hysterical state. All the cranial nerves are normal. The spine is not tender in any region; there is no deformity of the spinal column.

*Motor.*—All the movements about the waist line and in the upper extremities have a normal friction. There is a mild weakness in the ankles at both extension and flexion, the left slightly more than the right, and flexion shows a little greater weakness than extension. There is weakness at the joint of both flexion and extension of a milder degree. All movements of both hip-joints show a marked weakness.

*Reflexes.*—Abdominal reflexes are present above the umbilicus; none below. All the deep reflexes in the upper extremities are normal. The gluteals are brisk; the patellars are slightly exaggerated, left more than the right. The prepatellar is present, right greater than the left. The knee-jerks are exaggerated, left equalling the right. The toe phenomena are present as tested by the Babinski, Oppenheim, and Gordon methods. Many times these tests are neutral, the left and right about equal.

*Sensation.*—Mild relative analgesia, and anesthesia from the tenth dorsal segment down. In the tenth dorsal segment there is a question—undoubtedly diminution in the eleventh dorsal segment and downward. The depression sense is definite from the eleventh dorsal segment downward, probably more than the superficial sense. Sense of position in the lower extremities practically nil. The tuning fork (256 X) could not produce any vibrations in any of the pelvic bones on the lower extremities. In the third lumbar spinal process the vibrations were normal, diminished at the fourth and absent at the fifth and downward. Patient was treated two weeks medically, and the second examination made showed no change in her condition. May 4th, rachiocentesis performed at 10 a. m. Third lumbar spinal used, pressure equals 350 mm. water gauge. Fluid clear, 30 c.cm. No flocculi, albumin slightly increased. A very slight increase in globulin present. Twelve lymphocytes per cubic mm. small and large were present. A considerable debris, some amorphous or crystalline, some degenerated endothelial cells present. Removal of laminæ of seventh, eighth, ninth and tenth dorsal vertebræ. A cyst the size of a grape was formed at the level of the ninth segment. It was removed. Dr. Skoog tells us it was an arachnoid cyst, such as has been described by Sir Victor Horsley. Following operation there was considerable amount of pain and cramp in the legs and lower abdomen for some days. Urinary retention was present for eleven days. When the patient left the hospital for home her neurological condition had improved. Vibration test showed great improvement; it was more in the right malleolus, little in the left. Pelvis and sacrum normal. Pin prick in the left leg now gives pain which was not the case before the operation. The patient states that her buttocks, which formerly seemed as if she was sitting on ice, now are more normal. Skin now moist, formerly dry.

On June 27th, 1913, patient was examined in the office; there has been a great improvement. She had had no pain or compression symptoms. Patient can walk without support, can also walk up and down stairs, can stand on both toes, but cannot stand on either foot alone. The patella reflexes are brisk, left slightly more than the right. No prepatellars are present. Now about 15 per cent. of the tests in the ankles are incorrectly referred to. Deep sensation normal. Superficial sense also normal in the lower extremities.

This patient was heard from in December, 1914, at which time she was walking around and tending to her ordinary duties without any of her former symptoms.

CASES VII AND VIII.—Carcinoma of the penis. The two cases pictured in Figs. 6, 7, 8, 9 and 10 represent nearly every phase of cancer of the penis, on the clinical side. One is confined to the foreskin; one is on the glans penis; one shows the supposed irritating influence of a long prepuce; one shows the supposed irritating influence of previous chancroids; one is of the cauliflower variety; one is of the ulcer variety.

The patient whose growth is illustrated in Fig. 6 was a male, *æt.* forty, married, a farmer. Seven months before he presented himself he had slipped while climbing over a fence, lit straddle of it, falling on and bruising the penis. Since then the growth had gradually developed. It gave him little or no

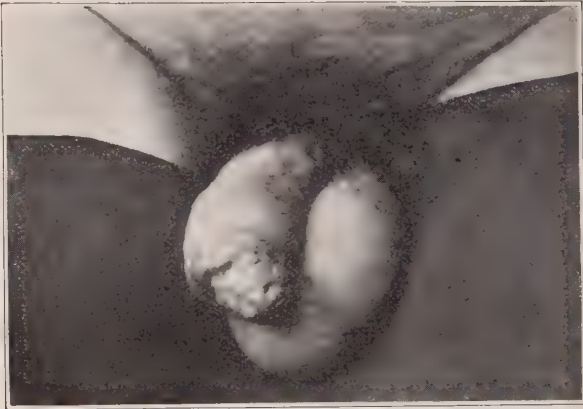


Fig. 6.—Cancer of the penis (Case VII).



Fig. 7.—Penis in Case VII bisected after amputation to show growth confined to the foreskin.

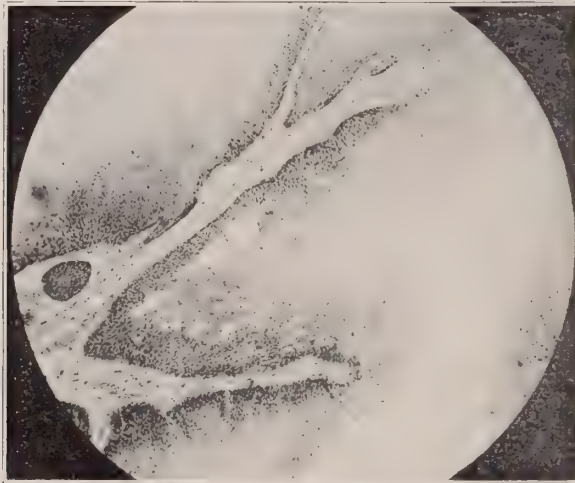


Fig. 8.—Microphotograph of a section of the growth in Case VII.

pain. The inguinal glands were enlarged on both sides. He had always had an elongated prepuce.

The operation, October 7th, 1913, consisted of an amputation of the penis and a removal of the inguinal glands. The testes were not removed.

When heard from February, 1915, he was in good health, with no recurrence or metastasis. There is no infection of the urine or cystitis, such as not infrequently occurs in cases similar to this with a short urethra. The most foul



smelling case of infected urine we have ever taken care of occurred in a man who had mutilated himself by performing an amputation of his own penis with a sharp stone, for causes which he would never divulge.

Fig. 7 is a photograph of this penis split open, demonstrating that the growth is confined to the foreskin.

The other case occurred in a man, *æt.* fifty-two, a widower, whose wife, it is interesting to note, died of cancer of the cervix. He acquired an open sore on the penis (Fig. 9) in August, 1914, which spread rapidly and was considered a chancroid by his physician, inasmuch as other sores of the same

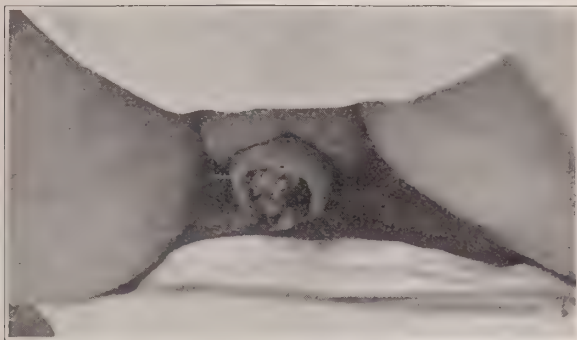


Fig. 9.—Cancer of the penis (Case VIII), confined to the glans.

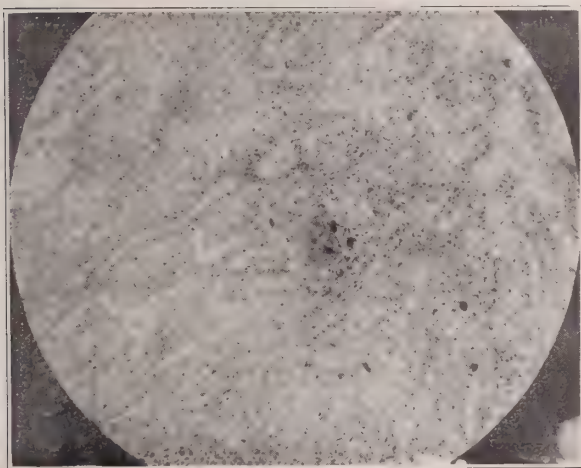


Fig. 10.—Microphotograph of epithelioma of the penis (Case VIII).

character developed at the same place. He had previously been upon anti-syphilitic treatment, and was again placed upon it.

He was, however, not sufficiently careful of himself in the matter of personal cleanliness, and the chancroids grew so, that in October his physician performed a circumcision on him. It was discovered that he had a sore developing on the glans penis in February, 1915. This was resistant to all forms of local treatment. It was indurated slightly, and of an ulcerous character, so that a piece was excised for microscopic examination. This was reported to be an epithelioma (Fig. 10). In March, 1915, an amputation of the penis was done.

There was no enlargement of the inguinal glands, and no dissection of them was made. The patient when last heard was doing well.

CASE IX.—Chronic intussusception. A thin somewhat arteriosclerotic man, *æt.* sixty-three, was referred to us on September 15th, 1914, on account of a lump in the right side of the abdomen, with a diarrhea. The trouble had started five weeks before, with a sudden pain in the right side of the abdomen, and a short spell of vomiting. A week later a tumor, the size of a man's wrist was palpable in the right abdomen about on a level with the umbilicus. Diarrhea with five or six watery movements a day supervened.

On examination the smooth movable tumor was felt, and little was added to the original examination, except to find a trace of blood in the stools. The blood-pressure was 140, the urine contained a trace of albumin. Operation revealed a distended small intestine and a smooth hard tumor apparently in the ascending colon. On following down the longitudinal muscle fibers of the colon it was discovered that the small intestine appeared to enter directly into this mass; no appendix was visible. Traction on the small intestines, resulted



Fig. 11.—Abnormal first rib simulating cervical rib.

in pulling out an intussusciptions nearly 7 in. long, which had become hardened and infiltrated, and was of a dull whitish color. The appendix looked innocent but was removed. The ileum was stitched to the colon so as to prevent a recurrence of the intussusception, and the abdomen closed. The patient made an uneventful recovery and is to-day alive and well.

Undoubtedly this intussusception had been present for five weeks.

CASE X.—First rib abnormality simulating cervical rib (Fig. 11). This x-ray is reproduced because the case seems to be very similar to the only reported case in the literature, that of Horslef's in Vol. XXXI, No. 11 of the *Journal of the Minnesota State Medical Association*.

The patient had symptoms of erythromelalgia of the hands, numbness, tingling, and easy disposition to pain on exposure to cold.

No operation was permitted although the disturbances are growing worse and may require operation in the future.

The appearance of the patient showed two prominent ribs in the lower cervical region which had previously seemed on palpation to be cervical ribs.

## THE DIETETIC TREATMENT OF ARTERIAL HYPERTENSION.

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By HORACE W. SOPER, M. D., of St. Louis.

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The subject of arterial hypertension has received considerable attention in the recent literature. Many writers, particularly Arnold,<sup>1</sup> Janeway,<sup>2</sup> Elsner,<sup>3</sup> Von Hecht,<sup>4</sup> Eustis,<sup>5</sup> Cornwall,<sup>6</sup> Dawes,<sup>7</sup> Van Rensselaer,<sup>8</sup> Hewlett,<sup>9</sup> and Norris,<sup>10</sup> have emphasized the value of dietetic treatment. Few, however, have used this treatment without the concomitant administration of drugs, rest in bed, high frequency current, etc. Credit is due to Arnold in calling attention to the great value of the restriction of protein in the dietary of nephritics, as well as formulating a simple and practical method of calculating the calories and protein content of the diet.

The following cases are presented with the hope that a series in which dietetic and hygienic measures alone were used might be of interest. In this series, cases of valvular disease of the heart were omitted in order that the problem of compensation might not enter too far into the question of the ultimate value of the fall in blood-pressure. Cases of syphilis are also not included for the reason that they could not be studied without the possible influence of drugs. Furthermore, only those cases were included that were amenable to dietetic restrictions. They were all kept under observation for a period of six months or more, the majority being from one to three years.

The grouping of the cases is based upon the probable underlying pathological condition rather than a possible etiological factor, age, or subjective symptomatology. The total number tabulated is 70, all ambulant cases.

The systolic pressure alone is recorded (Faught's instrument). The table shows the initial blood-pressure and weight, as well as the ultimate blood-pressure and weight. In the column marked 'Subjective,' the word 'Free' means relieved from disturbing symptoms and increase in strength and vigor. 'Improved' means amelioration of symptoms with but little improvement in the general condition. 'Not improved' means that regardless of strict adherence to the diet, the symptoms were not influenced. Under the heading of 'Protein' appears the estimated number of grams of protein in the daily ration required to maintain the ultimate blood-pressure. The number of grams of meat consumed daily is added when it was used in the dietary.



As a working rule the following diet was given, and the patient instructed to follow it for a week.

DIET LIST.

1. Always bring this list with you when returning to this office.
2. Do not under any circumstances eat or drink anything else.
3. Eat slowly and chew the food well.

One glass cold water upon arising.

*Breakfast:—*

Oranges or grape fruit.

Cereals with cream.

Eggs: soft boiled, poached, omelette.

Toast and butter.

One cup hot water flavored with cream.

11 a. m. One glass cool water.

*Lunch:—*

Orange or grape fruit.

Creamed vegetable soups (no meat stock).

Stewed white onions, oyster plant, carrots, celery, spinach, asparagus, string beans, well mashed squash, well mashed turnips, cauliflower, artichokes, baked or broiled egg plant, okra, corn.

Raw celery, onions, tomatoes, olives.

Lettuce, tomato and fruit salad, with French or mayonnaise dressing.

Custards, gelatines, cornstarch, tapioca.

Stewed fruits.

Whole wheat bread and butter.

Raw fruits.

One glass cool water.

4-5 p. m. One glass cool water.

*Dinner:—*

Creamed vegetable soups (no meat stock).

Roast beef, roast lamb, roast chicken, or roast turkey, without dressing.

Broiled lamb chops, broiled steak.

Baked fresh fish.

(Portion of meat to correspond in size to the lean part of one lamb chop.)

Potatoes well mashed, or rice well cooked.

Other vegetables same as at lunch.

Whole wheat bread and butter.

Stewed fruits.

Raw fruits.

One glass cool water.

Avoid all condiments, such as mustard, horse radish, catsup, etc. Use very little sugar, very little salt, no pepper. All vegetables should be very well cooked without the addition of meat, fat, or sugar.

At bedtime: One glass cool water.

Upon the patient's return to the office the approximate amount of food eaten, together with the protein, was calculated by Arnold's method were taken. Additions and subtractions were made as appeared to be indicated, taking into consideration the general condition of nutrition, the digestive processes, as well as the subjective symptoms.

In many cases meat was withdrawn, then added from time to time, and the results noted. Two thousand calories and 50 to 60 grm., of protein represented the average daily quantity consumed. However, some patients consumed more than 100 grm., one in particular reaching the high figure of 150 grm. In many cases considerably less protein was used to produce the initial fall in blood-pressure. However, the figures in the table represent the number of grams required to maintain a good state of nutrition with a blood-pressure that appeared to be the desired one for that particular individual.

General hygienic measures, such as physical exercise, periods of rest, abstinence from alcohol, coffee, tea, and cocoa, and reduction in tobacco when used to excess, were insisted upon in all the cases.

The daily quantity of water to be consumed is another important feature. Eustis and others recommend copious water drinking with the idea of flushing out the tissue poisons. Von Hecht on the other hand severely restricts the fluid intake. My experience is that water should be used regularly and in sufficient quantities to produce proper elimination,—approximately two quarts daily.

### Group I.

#### Chronic Interstitial Nephritis, Well Established.

	Age	Occupation	Initial B. P.	Ultimate B. P.	Initial Weight	Ultimate Weight	Grams of Protein	Grams of Meat	Subjective
Case 1,	Female, 67,	Housew.,	220	150	160	160	50	30	Free.
Case 2,	Male, 65,	Teacher,	230	150	170	170	60		Free.
Case 3,	Female, 63,	Housew.,	240	170	150	140	50		Improved.
Case 4,	Female, 55,	Housew.,	180	160	140	140	80		Improved.
Case 5,	Female, 45,	Housew.,	160	130	147	153	70	30	Free.
Case 6,	Male, 44,	Mfgr.,	212	160	160	160	40		Free.
Case 7,	Female, 52,	Housew.,	225	140	116	120	50	30	Free.
Case 8,	Male, 75,	Retired,	235	180	130	135	40	30	Improved.
Case 9,	Female, 47,	Housew.,	185	120	105	110	50		Free.
Case 10,	Male, 39,	Mfgr.,	200	155	132	131	50		Not improved.

## Group II.

## Beginning Nephritis.

Albuminuria, hyaline casts, low specific gravity, reduction in urinary solids, without cardiac hypertrophy.

In all cases the urine changed in character after treatment, albumin and casts disappeared and specific gravity became normal.

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	Age	Occupation	Initial B. P.	Ultimate B. P.	Initial Weight	Ultimate Weight	Grams of Protein	Grams of Meat	Subjective
Case 11, Female,	52,	Housew.,	180	135	145	145	70	30	Free.
Case 12, Male,	59,	Merchant,	190	140	180	180	80	30	Free.
Case 13, Female,	37,	Housew.,	180	130	101	108	50		Free.
Case 14, Male,	52,	Machinist,	210	170	150	160	50	30	Improved.
Case 15, Female,	47,	Housew.,	160	130	145	140	50		Free.
Case 16, Male,	50,	Physician,	160	130	160	160	60	30	Free.
Case 17, Male,	60,	Salesman,	185	150	146	153	60	30	Improved.
Case 18, Female,	60,	Housew.,	216	130	180	160	70	30	Free.

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My results are at variance with those of Cornwall, who maintains that the response to the diet as measured by the fall in blood-pressure is indicative of the degree of renal involvement. The above figures show in many cases a very marked fall in blood-pressure, even in cases of well-established nephritis.

## Group III.

## Arteriosclerosis Without Demonstrable Kidney Lesions.

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	Age	Occupation	Initial B. P.	Ultimate B. P.	Initial Weight	Ultimate Weight	Grams of Protein	Grams of Meat	Subjective
Case 19, Female,	65,	Office work,	200	140	150	150	70		Free.
Case 20, Male,	55,	Builder,	190	155	172	157	80	50	Free.
Case 21, Male,	40,	Optician,	160	140	138	135	80		Not improved.
Case 22, Male,	70,	Contractor,	185	145	190	190	100	50	Not improved.
Case 23, Female,	70,	Housew.,	210	160	170	160	90	30	Free.
Case 24, Female,	70,	Housew.,	180	140	140	140	60	30	Free.
Case 25, Male,	52,	Office work,	210	170	150	160	70		Not improved.
Case 26, Female,	54,	Housew.,	190	140	101	110	80	30	Free.
Case 27, Male,	60,	Lawyer,	180	130	195	185	80	30	Not improved.
Case 28, Male,	55,	Mfgr.,	180	150	133	135	60	30	Not improved.
Case 29, Female,	52,	Housew.,	185	150	160	150	80	30	Free.
Case 30, Female,	70,	Housew.,	230	150	180	160	80	30	Free.

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In the above cases the urine was considered normal, based on Cabot's findings that the color and specific gravity of the twenty-four-hour quantity was the best index of the kidney condition. Furthermore, in all these cases albumin and casts were absent.

In cases Nos. 21, 22, 25, 27 and 28, the diet reduced the blood-pressure, but did not relieve the symptoms. All were much benefited by the administration of sodium iodide.

While it is not my intention to discuss any drug effects, I will mention that in many cases of hypertension, particularly in the aged, the iodides have a definite specific effect in the amelioration of symptoms, even when the pressure itself is not markedly influenced.

#### Group IV.

Gout as Evidenced by Exudative Arthritis, Heberden Nodes, etc.

	Age	Occupation	Initial B. P.	Ultimate B. P.	Initial Weight	Ultimate Weight	Grams of Protein	Grams of Meat	Subjective
Case 31, Female, 59, Housew.,	170	135	135	135	60	30	Free.		
Case 32, Female, 60, Housew.,	175	125	175	160	70	30	Free.		
Case 33, Female, 70, Housew.,	180	140	200	180	70	30	Free.		
Case 34, Female, 56, Housew.,	195	150	207	190	80	30	Free.		
Case 35, Female, 54, Housew.,	230	155	139	146	60		Free.		
Case 36, Female, 59, Housew.,	225	150	235	195	80		Free.		
Case 37, Female, 53, Housew.,	170	135	134	143	60	30	Free.		
Case 38, Female, 49, Housew.,	170	140	120	120	60		Not improved.		
Case 39, Female, 64, Housew.,	170	135	125	127	50		Free.		
Case 40, Male, 60, Grocer,	160	130	207	185	90	30	Improved.		
Case 41, Female, 62, Housew.,	170	140	170	160	70		Free.		
Case 42, Female, 56, Housew.,	190	170	245	180	80	30	Improved.		
Case 43, Female, 67, Housew.,	190	130	156	153	70	30	Free.		
Case 44, Female, 38, Housew.,	170	135	108	110	50	30	Free.		

## Group V.

Chronic Constipation With Evidences of Intestinal Toxemia, Digestive Disturbances, Headaches, Vertigo, etc.

	Age	Occupation	Initial B. P.	Ultimate B. P.	Initial Weight	Ultimate Weight	Grams of Protein	Grams of Meat	Subjective
Case 45, Female,	49,	Housew.,	180	130	157	150	70	30	Free.
Case 46, Female,	69,	Housew.,	190	150	135	135	50		Free.
Case 47, Female,	31,	Housew.,	150	120	150	150	60	30	Free.
Case 48, Female,	62,	Housew.,	175	135	158	153	80	30	Free.
Case 49, Male,	48,	Broker,	170	140	150	160	80	50	Free.
Case 50, Female,	73,	Housew.,	180	150	186	186	70	50	Free.
Case 51, Female,	46,	Housew.,	170	140	117	137	80	30	Free.
Case 52, Male,	27,	Clerk,	145	120	143	149	60	30	Free.
Case 53, Female,	35,	Housew.,	150	120	140	145	80	30	Free.
Case 54, Male,	42,	Merchant,	160	130	180	170	80	30	Free.
Case 55, Male,	55,	Salesman,	170	130	150	160	70	30	Free.
Case 56, Male,	45,	Clerk,	165	125	145	145	80	30	Free.
Case 57, Female,	60,	Housew.,	190	150	180	160	90	30	Free.
Case 58, Male,	35,	Mfgr.,	155	125	140	140	50	30	Free.

Torrey<sup>11</sup> and Hewlett particularly emphasize that high blood-pressure may exist without primary change being demonstrable in the heart, kidney, or arterial walls.

Contrary to Eustis' findings, very few of these cases showed any degree of indicanuria.

Constipation was a factor in a vast majority of the cases in all the different groups. However, in the above table the constipation appeared to be the chief element in the production of the high blood-pressure. Practically all the cases in Group V had been taking purgatives, particularly the salines, as well as water enemas, when they came under observation. In my experience these measures are all harmful, inasmuch as they upset the normal peristalsis and interfere with general metabolic processes. The treatment to be recommended is a laxative diet, agar-agar, paraffine oil, enemata of sterilized cottonseed oil, abdominal muscle exercises, etc. The drastic purgatives may temporarily bring down blood-pressure, but the effects are not lasting, and the continued use is followed by bad effects.

## Group VI.

Disorders in Metabolism Such as Diabetes, Digestive Disturbances, etc., in Which the Cause of the Hypertension Was Obscure.

	Age	Occupation	Initial B. P.	Ultimate B. P.	Initial Weight	Ultimate Weight	Diagnosis	Grams of Protein	Grams of Meat	Subjective
Case 59, F.,	50,	Hw.,	240	160	175	160	} Mod. Diabetes Achy. Gast.	100	60	Free.
Case 60, F.,	31,	Hw.,	160	130	147	150		80	30	Free.
Case 61, F.,	53,	Hw.,	170	130	142	145	Mild Diabetes	100	50	Free.
Case 62, M.,	52,	Phys.	170	150	151	153	Duo. Ulcer	100	60	Free.
Case 63, F.,	50,	Hw.,	160	130	150	150	} Achy. Gast. Diarrhoea	80	30	Free.
Case 64, M.,	70,	Ret.,	180	135	120	125		50		Free.
Case 65, F.,	60,	Hw.,	190	140	120	120	Arth. Deform.	70		Not im.
Case 66, F.,	50,	Hw.,	180	130	170	150	Diabetes	100		Imp'd.
Case 67, F.,	45,	Hw.,	185	185	150	150	} Adenoma Thy- roid Tumor 1 lobe.	50		Not im.
Case 68, M.,	37,	Cl'k,	204	140	174	170		50		Im'pd.
Case 69, M.,	57,	Mer.,	170	135	177	170	Diabetes mod.	90		Free.
Case 70, F.,	53,	Hw.,	165	140	138	133	Diabetes mod.	110		Free.

The cause of the high blood-pressure in some of the cases of diabetes was undoubtedly due in part to a diet composed largely of meat.

Case No. 59 was on a 'strict diabetic' diet, and was consuming approximately 250 grm. of protein a day. The disease was of the moderate type, and the carbohydrate tolerance was found to be equivalent to 150 grm. of bread a day. Within 4 weeks after re-arranging her diet, allowing 150 grm. of bread and potatoes, and reducing the protein intake to 100 grm. a day, the blood-pressure dropped to 160, and her headaches, vertigo, and nervous symptoms disappeared.

Case No. 68 showed a remarkable sensitiveness to meat, a small amount, as much as 15 grm., at once sending up the blood-pressure and causing a peculiar skin eruption, which Dr. M. F. Engman diagnosed as pompholyx. Dr. Engman had observed him a year before and found that the eruption disappeared on a vegetable diet, to return again after the ingestion of meat. I found that this was true, and that the blood-pressure rise was coincident with that of the appearance of the skin eruption. This case in all probability is to be regarded as a manifestation of anaphylaxis, the patient being sensitized to meat protein.



Voit,<sup>12</sup> Rubner,<sup>13</sup> McCay,<sup>14</sup> Lusk<sup>15</sup> and others believe that 120 gm. of protein is the required daily quantity for an average man performing light work. Cathcart<sup>16</sup> recommends 90 gm. On the other hand, Chittenden,<sup>17</sup> Folin<sup>18</sup> and others believe that from 40 to 50 gm. are sufficient. While this difference of opinion is widespread in regard to the effect of protein in healthy men, practically all clinicians are unanimous in the opinion that in diseased conditions affecting the vascular and renal tissues, a reduction in the daily intake of protein becomes a necessity.

In the attempt to produce this reduction many physicians prescribe a milk diet. The objections to this diet are first, as Cathcart particularly emphasizes, the caloric value of the diet given influences very definitely the protein minimum intake required by the organism. In order to reach 2,400 calories a day the enormous quantity of 3,400 gm. or 3½ quarts must be consumed, giving a protein quantity of 140 gm.—far too high. Secondly, the nature of the food which is fed with the protein influences very materially the amount of nitrogenous material required. Should the milk diet, however, seem advisable, the protein may be reduced by using one-half the quantity of milk and adding sufficient cream, egg yolk, butter, and sugar of milk to make up the required calories.

Some physicians advise simply against 'red meats,' allowing all kinds of white meat, regardless of quantity. All recent experimental work on this subject can be summed up in the words of Lusk,<sup>19</sup> who says, "that the relative value of beef, veal, mutton, chicken, etc., shows no difference, but the substances convertible into uric acid are present in all these meat foods in about the same quantity."

A mixed diet as set forth in the above list is preferable, inasmuch as it is convenient, affords variety, and contains the ordinary foods found on the average table. Obviously the condition of the digestive apparatus will be the key to whatever changes may be necessary.

As shown by the figures in all the above groups the amount of protein ingested in twenty-four hours must be the determining factor in the production of the required fall in pressure. In many cases it was found advisable to omit meat foods entirely from the dietary for a considerable time. Marked improvement in general well-being in a number of these cases was produced by additions of small amounts of meat, 15-30 gm. per diem. In others no such stimulating effect was produced. Hutchinson<sup>20</sup> believes this stimulation to be due to the specific dynamic action of the protein. However, we must remember, as Lusk emphasizes, that all proteins have this property in common. The conclusion is obvious that some other factor must be responsible for the good effects

often seen by the addition of so small an amount of meat protein. In all probability the cause is to be found in the quick absorption of this form of protein and the consequent rapid stimulus to metabolism.

The following general conclusions seem to be warranted.

1. High blood-pressure is found in a large number of pathological conditions. In many cases the etiological factor is difficult to determine. The excessive use of alcohol, tobacco, coffee, tea, and protein, lack of exercise, and neglect of general hygienic rules are doubtless all factors leading to the pathological conditions of which hypertension is the chief indicator.

2. Reduction of the protein in the dietary causes a fall in pressure, as well as amelioration of the symptoms in a vast majority of the cases. We must, therefore, conclude that in the conditions resulting in hypertension the organism is no longer able to utilize the usual quantity of protein. Excessive amount of the proteins of wheat, milk, and eggs, is as deleterious as the meat protein. The good effect is produced by a reduction of the *total amount of protein ingested daily*.

3. There is no evidence that 'putrefactive changes' in the intestines and resulting indicanuria is the cause of high arterial tension, but the real cause is to be looked for in a more complex disturbance in metabolism, the exact nature of which is as yet unknown.

4. The generally accepted statement that advance in years is accompanied by a physiological rise in blood-pressure is open to question. In my series, many cases in the aged responded to treatment by the administration of iodides or the protein reduction method. Furthermore, many persons of advanced years in good health do not present high blood-pressure. High arterial tensions should be regarded as indicating an abnormal condition which in a large majority of cases is amenable to treatment.

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## AN ETIOLOGICAL STUDY OF ASTHMA AS A BASIS OF TREATMENT.

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That paroxysmal dyspnea, commonly called asthma, is not a disease, but a protest from a system carrying an overload while performing one or more of its numerous and complex physiological operations; that it does not occur as an entity, but always because of an underlying functional disorder as variable as that which produces headache, or the omnipresent female backache—this is both my premise and my conclusion. I state it thus frankly at the outset, asking that the reader accept it as a working hypothesis, which I trust the study undertaken at this time will amply verify.

Asthma has, heretofore, been designated as a disease presumably incurable, and our efforts to allay it have been directed toward the finding of a specific or 'cure'; that we have failed is because we have attempted to treat a symptom alone.

This very prevalent and incapacitating disturbance that has been oppressing man and beast almost since time began, and is on the increase, Osler once called the 'disease of theories,' and a perusal of the literature proves his statement, but theories are the pioneers that blaze the way through the wilderness to ultimate success.

Asthma is a physiological disturbance and has practically no pathology of its own. Such pathology as is found shows in the nature of a right heart dilatation or an emphysematous lung with some congestion of mucous membrane in the bronchial tubes.

From time to time contributions have been offered showing that certain anatomical and pathological conditions are producing asthma. For instance, Voltolini in 1871 reported that the removal of the polypi from the nasal passages would cure asthma. Immediately, asthmatics were subjected to nasal explorations, a practice which has been indulged in more or less ever since with very unsatisfactory results.

The etiology of asthma has never been compiled and probably will not be for years to come. Its eradication depends entirely on a known etiology in each individual case, and it must be studied from that standpoint if with any hope of successful radical treatment.

Many of the generally accepted theories regarding the causes of asthma must be either modified or discarded entirely before we are free to discuss and study the etiology of asthma. These will be taken up in succession in this study.

*Heredity.*—Salter, who probably wrote the first real contribution on the subject of asthma, gives heredity credit for 40 per cent. of all cases. A general acceptance of, and belief in, this statement on the part of the profession and patient immediately produces the mental attitude of hopelessness, a most fatal and insurmountable barrier to possible remedial treatment.

In nearly three hundred patients, the writer has had no cause to reckon with heredity as a factor, and concludes that heredity is a poor defense behind which to dodge when confronting the batteries of this enemy.

Adam says: "Heredity and upbringing are so entangled that a differentiation is difficult"—a most illuminating statement. For instance, a bad upbringing along culinary lines with vicious results which include asthmatic attacks cannot with justice be charged to heredity.

*Climate.*—Almost as much abused as heredity, climate does not begin to play the part as a contributing cause of asthma that has been credited to it.

All over the world patients are exchanging locations, the one finding relief in a location where another met discouragement and despair. An examination of the patient and his living conditions, diet, exercise, etc., will almost always reveal the cause, regardless of place. A patient does not, as generally believed, wear out a climate, but has, as a rule, returned to his old and vicious methods of living. Of course, there are exceptions to this, but experience based on observation of a large number of patients justifies the statement.

There is a very, very small percentage of patients whose asthmatic troubles we are justified in referring to this cause. True, there may be some underlying causes which a high and dry climate keeps in abeyance, and so the asthma is prevented, but the average asthmatic who changes climate and is helped, as a rule changes his entire method of living, with nearly always an improved systemic elimination.

*Season.*—Reference to five standard works shows three in favor of winter and two of summer as being the time when asthma is more prevalent. The fact is that when an imbalance exists between intake and elimination, asthma will be found to increase, winter being the time when this generally occurs. A heavy meat diet, absence of fruit and fresh vegetables, less exercise, less water-drinking and consequent perspiration, followed by a much lessened kidney and skin flushing, produces constipation with resulting asthma. Therefore, not the season, but the faulty life of the asthmatic should bear the onus. The mucous membrane is called into action in elimination. When it is subjected to heavier work, a congestion results, and we often find a turbinal turgescence and a highly irritated

membrane throughout the nose and throat. This point will be followed up later.

*Occupation.*—Asthma is much more prevalent among the well-to-do than the working classes, because of sedentary habits in the former. Faithful following of a prescription calling for a daily round of golf or some other out-door exercise has cured many an asthmatic. Such patients, living in sections where winter interrupts out-of-door sports, unless they substitute some other form of exercise, find themselves, toward spring, beginning to wheeze and wish for warm weather. Then the long-suffering climate is blamed, whereas the facts are that elimination has been reduced to a low point, a toxemia has developed and asthma has followed.

Bouchard has shown that open air exercise increases elimination by intestines, skin, respiration and kidneys. Asthma, as previously intimated, is not found among men and women whose occupations require plenty of outdoor exercise. Physiologists have for many years shown that a disturbed body metabolism, resulting from vicious diet, produces several alkaloids, which, unless eliminated as a result of severe muscular exertion, are productive of serious consequences.

Brodie and Dixon, in 1902, demonstrated the presence of muscarin in the intestinal canal as a result of decomposed albumin. Muscarin produces an asthmatic spasm. Its antagonist is atropine, and we find atropine to be our best general weapon in handling the paroxysm.

*Sex.*—The ratio between males and females changes with the different decades of life. In the first decade, while we find comparatively few cases, males predominate almost two to one. No satisfactory explanation has ever been offered for this. The second decade shows the sexes about equal, while the third reverses the ratio and females predominate. The fourth carries more males, while the fifth decade favors females.

The second decade is the out-of-door athletic period in both male and female, and this is possibly a big factor in not only reducing the actual number of cases of asthma, but also in equalizing the sexes.

Adam has pointed out that the predominance of asthma in women during the third decade is due to the establishing of a home life of their own, resulting, on account of preoccupation, in a more or less careless personal dietary, lack of outdoor exercise, with consequent constipation and intestinal putrefaction. My own experience with patients seems to justify his statement.

During the fourth decade males begin to show the results of gastro-intestinal abuses, and the percentage of males proportionately increases.

The menopause has been charged with a multitude of sins, asthma



included, and, indeed, figures show that during the fifth decade the ratio is over two to one in favor of the number of women commencing an asthmatic life. This is the age when parturition is passed, when the muscles of the chest, abdomen and back relax and an atrophy sets in. Examination shows an abdominal ptosis varying in degree from a simple gastropotosis to a complete splanchnoptosis, and the resulting asthma may be accounted for in at least two ways: (1) Diaphragmatic irritation from gastropotosis, and (2) intestinal stasis and putrefaction with resultant toxemia because of enteropotosis.

An abdominal support made to fit properly and that holds the abdominal wall in place, while it cannot return the organs to their normal position, does take off a large part of the strain and gives very positive results in the relief of asthma.

A typical case illustrates some 22 cases thus treated:—

Mrs. D., *æt.* forty-three, healthy all her life; four children; all normal births. Asthma began moderately two years ago, increasing gradually in severity. Marked constipation, flatulent most of the time.

*Examination.*—General abdominal ptosis.

*Diagnosis.*—Asthma following abdominal ptosis.

*Treatment.*—Abdominal support, regulation of diet to relieve constipation. Relief followed at once and the case went on to positive cure.

This abdominal condition is found to exist in men in the forties in a surprisingly large percentage of cases of asthma.

Uterine malpositions are to be seriously considered as a very probable cause of asthma. A history covering the relation of asthmatic attacks to menstruation, together with a vaginal examination, will clear up the diagnosis in many cases.

Ventral fixations have cured four cases in the writer's practice. These are reflex occurrences, and while not as commonly encountered as some causes, doubtless are a contributing factor in many more cases than are recognized.

*Nose.*—Nasal conditions, as related to asthma, have claimed attention for many years, and much has been learned regarding their possible contribution to paroxysmal dyspnea.

Patients in whom nasal passages are blocked become mouth-breathers, and mouth-breathing asthmatics cannot be cured. The nasal passage must be considered and treated. At once the question of method arises. Anatomic malformations, such as septal deviations or spurs, call for surgery. Mucous membrane hypertrophies that have dammed nasal drainage and given rise to a sinusitis are not to be ruthlessly cauterized and removed. The underlying cause is to be discovered. Usually an intestinal toxemia coupled with poor elimination is the primary cause, and this must be corrected before permanent good results will obtain.

The available statistics in this direction are legion, but vary so widely that one is forced to the conclusion that the patients have not been under observation for a sufficient period, following a nasal operation, to make the figures of any value.

Adenoids may play some secondary part in the production of an asthmatic seizure, but since they in turn have almost positively been determined to be the result of an imbalance in body metabolism growing out of dietary errors, their removal does not eliminate the real, though it may be the remote or obscure cause.

*Mouth.*—The fact that good healthy teeth are necessary to gastrointestinal efficiency is obvious. Poor mastication and the absorption that takes place from diseased cavities are not to be overlooked.

*Diet.*—Here we reach what the writer considers the controlling element in the etiology and treatment of asthma.

The strongest proof of this is shown in the natural course of an asthmatic attack, during which the patient, as a rule, does not demand food, and after a few days' fast, the attack lessens and disappears. The pressing of food upon two of my own patients during the decline of an attack brought back the symptoms and prolonged the session.

In support of this position, I beg to quote Adam, who, in an article sent the writer after seeing a previous paper by him on the subject, summarizes the question of intestinal physiology to prove further the part played by diet in the production of asthma, when he says, "Asthma is closely associated with excess of food, particularly of carbohydrate food, relatively to the individual's metabolic capacity and to the amount of his exercise. When these are properly adjusted to each other, the asthma ceases in most cases. Too much carbohydrate—energy food—may interfere with due metabolism of tissue foods and of the tissues themselves, especially in the absence of sufficient muscular exercise. If the less complex carbohydrate molecule is oxidized at the expense of the more complex nucleo-proteids, these will be imperfectly metabolized and give rise to such toxins as may cause asthma."

A careful investigation of the diet of asthmatics, as they present themselves, brings us to the conclusion that here we often find the crux of the situation. Correction of dietary errors is most necessary, and any attempt at treatment is likely to be futile which fails to reckon with diet. When faulty, experience has proved it to be a strong etiological factor in a great percentage of cases. Recognition of this truth at once clears the way, and radical treatment should follow, resulting in a preponderance of cures.

The treatment followed by the writer consists in providing the patient with a dietary that first of all lessens the quantity of food taken and brings about a better balance between proteid and carbohydrate. Next he insists on more thorough mastication, fewer

varieties of food at one meal and proper combinations of food, eliminating, for instance, such combinations as fresh acid fruits and milk. Relief from constipation, if present, should be immediately attempted, either through diet or if necessary by the use of laxatives. The drinking of water at the proper time and in sufficient quantity is of no small moment, and well regulated exercises to aid elimination are an absolute necessity. Each patient has his own individual needs and no routine can be laid down that will cover all cases.

The complications met with in asthmatics are usually noted in the cardiovascular systems and kidneys, and decidedly increase the problem. They nearly always call for rest in bed for a prolonged period and the regular diet usually prescribed for that particular class of patients.

These notes follow the observation of some three hundred asthmatic patients during the past five years, and are offered as being suggestive of the possibilities in the treatment of so serious a malady, there being many cured cases to offer as conclusive evidence that a varying etiology is the basis for radical treatment.



## A BRIEF PLEA FOR THE AFTER-CARE OF THE INSANE.

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During service in a state hospital one cannot help being impressed by the large number of readmissions. A record of such cases for five months showed the following percentage: July, 34 per cent.; August, 40 per cent.; December, 50 per cent.; January, 36 per cent.; February, 34 per cent. Such statistics suggest an economic side to the question of after-care of the insane, for patients returned to the hospital necessarily become an additional care and expense to the state or to the relatives. They also contribute much to the overcrowding of our hospitals, which, eventually, necessitates the building of new ones.

In the 1910 Government Report of the Insane and Feeble-minded in Institutions, there were readmissions amounting to 23 per cent. out of the 60,769 patients admitted that year. The biennial report of one of our state hospitals shows an average of 15 to 16 per cent. of recoveries per annum on admissions and readmissions; while another hospital reports 20 per cent. of recoveries. This difference in percentage may be due to the personal equation of the medical officer discharging the patients, for there seems to be no standard definition as to what constitutes recovery from insanity. So the care given patients while in the hospitals, and the effort made to restore them to their former mental health are, in a measure, wasted when no after-care is undertaken. It cannot be denied, however, that we are confronting a very knotty problem when we take up this question, but it is only by the establishment of a system of after-care that relapses can be prevented, and returns to state hospitals lessened.

In the Jacksonville State Hospital there were 886 patients admitted from July 1st, 1908 to June 30th, 1910, and about 20 per cent. of these patients were in their second attack. Out of 142 patients discharged as recovered in two years, 125 were after the first attack, 15 after the second attack, and 2 after the fourth attack. These figures make it apparent that the longer the duration of the insanity the smaller the possibility of restoration to former mental health.

There has been some systematic work done in after-care in Europe. Paris has been looking after discharged patients as far back as 1841; England since 1871; Switzerland now has an after-

care system; and Japan has had one since 1902. Something has also been accomplished in our own country. New York was one of the first states to take up the work, and the reports show splendid results. In Boston an out-patient department was opened at the Psychopathic Hospital in January, 1913. This proved so successful that at present nearly every large city in the state has a hospital undertaking some form of out-patient work. New Jersey, Rhode Island and Michigan are also doing some systematic work along this line. A bill to provide divisions of Mental Hygiene and Rural Sanitation in the United States Public Health Service, has passed the House, and is pending in the Senate.

Illinois is far behind these states, and is leaving most of the burden on the shoulders of private organizations. Provision for after-care was made, however, when the State Charities Commission was created, but nothing has been done by the state, although the need of an after-care system has been brought to public notice repeatedly and forcibly by the Charities Commission.

Two independent charitable organizations are doing reputable work in Chicago—the Bureau of Personal Service (a Hebrew Society), and the Illinois Society for Mental Hygiene. This latter society has recently become located in a permanent home, where it welcomes and assists those who, through a slight mental deficiency, have lost their grip on life. This society, although hampered for funds, received for after-care, during the year 1914, 261 patients from the various state hospitals. It has aided these patients by advice and the finding of easy, congenial employment. If an organization depending upon voluntary contributions can do such efficacious work, could not the state of Illinois cope with the situation easily?

Success or failure in life depends upon one's reserve force, and how one meets an emergency. It is the sudden failure in business, the unmerited criticism, or the loss of a dear one, that causes the breakdown in the mentally weak, for they are confronting a situation they are unable to meet. It is at such a time that a word of encouragement or the kindly helping hand can do much to prevent the relapse that sends the patient back to the hospital.

Stop for an instant and consider the difficulties a patient discharged from one of our state hospitals has to meet. He is not his normal self, but has recovered to such an extent that he is allowed to go home. He has been out of the business of life just long enough to cause him to lose confidence in himself. He is extremely sensitive, especially if he realizes his condition, and this makes him reluctant to return to his old surroundings, where he will be looked upon with suspicion, if not regarded as a curiosity; nor is he entirely ignorant of the fact that there is a sort of a stigma placed upon him and his family because he has been an inmate of an insane hos-

pital. These patients are unable to secure a position, as a rule, because of the fear and distrust the public hold of an insane person, and their idiosyncrasies and actions are often exaggerated in the eyes of those who do not understand them. Nor is this suspicion and lack of sympathy all they have to contend with. They have become accustomed to the routine and quietness of the hospital, as well as the good food and cleanliness. They have made friends there, and were not looked upon as queer, for they were in the midst of their own kind, and among those who made allowances for them. If the patient is the head of a family he worries because of lack of money and work, and being forced to stay in his old environment.

When all these things are taken into consideration it is easy to understand why one who is mentally sick is sorely in need of sympathy and kindly advice, as well as practical assistance. And it seems to me that one of the first steps to be taken is to educate the public concerning these unfortunates.

There has been a great deal of agitation in our own city recently because of several murders said to have been committed by mental defectives, and this has helped to augment the fear held by the public in reference to an insane person. But after-care will be greatly hampered unless an effort is made to disabuse the people of this fear, and impress them with the fact that one who is insane is suffering from an illness just as much as if he were afflicted with typhoid fever, and what he needs is sympathy and watchful care. No one considers it strange when a physician carefully instructs a patient as to care and diet after a severe physical illness. Why, then, should it be considered unnecessary to do the same for one who is mentally sick?

The state hospitals have been severely criticised of late for allowing patients to be paroled or sent home before they are cured. This, however, is not always the fault of the officials; for numerous incidents can be cited of relatives insisting upon the discharge of patients even against the advice of the physician in charge, who realizes they are not fit to go out into the world. The only recourse the hospital authorities have in such a case is to secure a written release absolving them from blame for harm coming to or through that patient. Such a release does not, however, always save them from harsh criticism.

In dealing with the question of after-care of the insane their previous education should be taken into consideration. That this is important is shown by the reports of state hospitals in which it is noticeable that the higher the education the less the insanity; for those with a common school education comprise about 76 per cent. of the inmates; about 9 per cent. can merely read; about 10 per cent. can neither read nor write; while those who have a liberal education comprise about 5 per cent. These figures may change with



future statistics, as the laws regarding compulsory education become more rigid. At present, however, it seems advisable to conduct a school in state hospitals for the purpose of educating patients in useful subjects and enabling them to be self-supporting when discharged, as such come largely from among the younger inmates.

The physical condition of the patients should also receive attention, and their ailments cured, if possible; or they should be given advice that would enable them to live comfortably with their defect.

Statistics show that the more advanced the profession the less the insanity, since laborers, domestics, miners, farmers, and those of no occupation comprise over 50 per cent. of the admissions to insane hospitals. Since about 25 per cent. of those admitted have no trade, why not anticipate the after-care treatment by forming trade-classes in state hospitals, such as millinery, dress-making, stenography, etc., for women, and carpentry, plumbing, horseshoeing, masonry, painting, paper-hanging, etc., for the men, so they would have a means of livelihood when they leave the hospital. If it is not possible to do this in the hospital, the state might obtain courses in trade-schools for the out-going patients, or apprentice them to some one capable and willing to teach them a trade. Each state hospital might also have an employment bureau, or be in touch with such a place, through which patients could secure work. One charitable organization has done admirable work in after-care by starting patients in business, such as news stands, notion stores, etc. Could not the state of Illinois do the same?

Another point to be considered in after-care is the financial condition of the patient. A majority of patients admitted to state hospitals are known as 'county patients,' and many of them come from needy homes. I have been told by patients that hospital conditions were much superior to what they have been accustomed to at home. If this is true, is it wise to send patients back to such an environment? If there was on hand a fund from which an out-going patient could draw to meet his needs until he becomes self-supporting, conditions might be slightly bettered. Then, too, if the legal provision, that each patient be given an allowance of money and clothing when he is discharged from the hospital, was more generally enforced, discouragement at least might be warded off.

After all, it is not only money and employment that a patient needs; for hampered by his sensitiveness and the realization that he is not like other people, he is, in a way, 'a man without a country.' This suggests the advisability of a 'big brother' movement in each city or town—a movement in which the state should take an active part. Such an organization could see that the wants of patients are supplied, positions secured for them, and friendly advice and sympathy extended. For they miss the friendship and companionship of the great hospital.

A plant that is withering and dying will become healthy and bloom if transplanted to suitable soil, but if reimplanted in the old soil will die. So with an insane patient. He improves under the routine and care of the hospital, but upon return to his old environment quickly relapses unless he is under watchful care. In some cases an entire change of residence is advisable. In the city this is not difficult to bring about, but in the country it is more so. It is well known that a large number of patients come from our rural population. If they cannot make a change, an effort might be made to relieve the monotony of their lives by pleasure trips, friendly visits, and the forming of societies.

It is among those suffering from the alcoholic psychoses, the infective exhaustive psychoses, manic-depressive insanity, and the undifferentiated depressions that the greatest amount of recoveries are made; and it is to such patients that special advice should be given, so that a recurrence may be prevented. Alcoholic cases, for example, have been known to get along quite well in 'dry territory.' Hospitals located in districts that receive patients from 'dry territory' receive very few alcoholic cases.

Before a patient leaves the hospital, however, a test such as is used with children (Binet-Simon scale of intelligence) should be made to determine what line of work they could profitably do. For when we place a patient in work he can do easily and well, he is usually happy, and we are promoting contentment and efficiency, which is very important in preventing a relapse.

But it is only through a careful study of cases which have recovered that we find the things to avoid in order to prevent a breakdown.

## OCCUPATIONAL HEART DISEASE.

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The ultimate cause of death in all instances is 'heart failure.' This is rather a lay opinion, but there is no disputing that it is just about so. Until very recently 'heart failure' was accepted as a cause of death throughout the country, and, indeed, in all except some of the more exact registration areas, it is still so accepted. The term has been very commonly used when the cause of death was not plain. In other words, it is a blanket term which is very convenient to use when, for some reason or other, it is not expedient to arrive at a closer diagnosis.

Dropping this loose definition of the term, and limiting ourselves to the subject of death through organic heart disease, we find ourselves with a definite entity. Organic heart disease is a recognized normal form of death, provided the individual has reached what is considered to be the normal span of life, the minimum of which should be placed at seventy years. It is true that the organic heart diseases which occur after this age are usually of structural pathology in the innervation, circulation and musculature of the heart walls, rather than disease processes in the heart valves. In other words, fibrosis characterizes senile heart disease. This form of heart disease and valvular disease, often associated with disease of the large arteries, is becoming astonishingly frequent in adults of all ages. An investigation of some of the more reliable vital statistics shows this to be the case (state of Ohio). The death-rate per 100,000 population from *diseases of the circulation*, and particularly organic heart disease, are shown to be increasing at the following rates:—

## DEATH-RATES.

Year	All causes combined (per 1,000)	Circulatory Diseases (per 100,000)	Organic Heart Diseases (per 100,000)
1909.....	12.76	155.95	108.26
1910.....	13.76	185.03	126.63
1911.....	13.09	206.95	157.32
1912.....	13.34	227.80	177.80
1913.....	13.78	228.73	179.37

Deaths occurring under seventy years of age from circulatory or heart diseases should be considered preventable in the vast majority of instances. In Ohio, in 1913, there were 11,357 deaths from dis-



eases affecting the circulatory system, or  $\frac{1}{6}$  of all the deaths (68,399). Organic disease of the heart itself caused 8,906 deaths, or nearly  $\frac{1}{8}$  of all the deaths. In fact, as a cause of death, consumption has been doubly outstripped by circulatory affections, 58 per cent. of which have occurred before seventy years of age, and 20 per cent. of which have occurred before fifty years of age. If the classification could enable us to separate out the 'farmers,' these rates for the balance of the people of the state would be very much higher.

A "Study of the Handicapped," made by the Council of Social Agencies and The Hospital Social Service in Cincinnati, states: "Cardiacs (*i. e.*, persons suffering from heart disease) constitute at once the largest single class and the one that presents the greatest difficulties. Few of them, because, among other reasons, their handicap is not evident, at present obtain suitable employment. They are, therefore, constantly relapsing into incapacity for work and need hospital treatment."

There are some associations of cause and effect which people fail to recognize, or do not care to recognize, and in no other field is this more to be noticed than this one in connection with the increase of the death-rate from diseases of the heart. Almost any daily paper which we chance to read mentions the death, here and there, throughout the vicinity or country, of prominent persons, who have died suddenly with 'heart failure.' In the vast majority of these instances neither the victims themselves, nor their friends and acquaintances, and even their family physicians have had any forewarning that a heart disease existed. It is only in that group composed of valvular heart diseases, which are acquired usually as a result of infectious diseases earlier in life, that foreknowledge of the condition appears to be the case. Such individuals are more apt to be careful of themselves, and thus prolong life, where the other great class of fibrotic cardiacs follow the cynosures of their ambitions or inclinations, without relaxation until the final moment arrives.

The following case is exemplary of what one may read in almost any newspaper. In fact, this one is clipped from the evening paper of the very day (in the afternoon) on which this paper was written:—

CASE I.—Man passes away at hotel. Stricken with acute indigestion and dies within a few hours. E. N. B., assistant superintendent of the Ohio division of the Baltimore and Ohio railroad, died Tuesday morning shortly after 7 o'clock in Room 426 at the V. Hotel. Dr. P. D. S., house physician, attended the sick man and was present when he died. He declared his death was due to angina pectoris, or neuralgia of the heart. Mr. B. was forty-five years of age.

There are, of course, some obvious reasons why deaths from heart disease should be on the increase. In the first place all degenera-

tive diseases are on the increase. This appears to be because degenerative diseases are adult diseases, and there are more persons reaching the adult ages to-day than formerly. This again is due to the lessening of the death-rate among infants, children and adolescents. That is, there are more who must die from the old age types of the diseases. This proposition, as such, would be a healthy situation, were it not for the unfortunate fact that the occurrence of death is not deferred until later in life. Another reason for the increase in heart diseases is the great falling off, in recent years, of deaths due to other causes, such as tuberculosis, typhoid fever, plagues, and catastrophes.

Except the small percentage of valvular heart diseases, which are congenital in origin, all of the other forms of valvular heart disease must be regarded as preventable, since they are due to infectious agents, strains, and sometimes poisons. The other great class of organic heart disease must also be declared preventable when they occur on the hither side of sixty-five or seventy years of age, because in like manner these can be shown to be due to the same causes, with an emphasis upon strain and poisons.

Strain may be of a sudden or unendurable character, causing acute dilatation, but this is probably so rare as to be hardly worth considering. The strain which does factor is that which is due to the steady up-keep of the blood-pressure without sufficient relaxation or rest intervals. This type of strain seriously interferes with the nutrition and innervation of this vital organ. This is the *occupational disease* which besets a wonderfully large percentage of Americans to-day. Its effects are almost impossible to be separated from those of slow acting poisons, and there is no reason to doubt that poisons of intrinsic origin, due to fatigue toxins, are a vital factor in the production of the fibroses which occur in the musculature of the heart and the arterial system, as well as in the associated eliminative organs—the intestines, kidneys and the liver.

This strain may be due to prolonged muscular activity in the person too delicately constituted for the activities in life which are being followed. For illustration, I would cite the following case:—

CASE II.—Miss X., female, twenty, white, United States, single. Etcher in a glass factory. Particular trade-process consists in rubbing prints on glassware and lifting and carrying the ware. Previous occupation, house work. Chief symptoms and conditions: Increased area cardiac hypertrophy, aortic impulse one intercostal space lower down and to the left. First sound, loud; second sound, accentuated. First symptoms appeared December, 1914. In patient's own words: "Something broke in the heart; ever since heart has felt full, oppressed and squeezed." There is also a constant lameness and numbness felt in the arm. Inquiry showed the girl was working with heavy glassware (from tumblers to large size vases); 200 to 300 pieces being held and rubbed in a single day, and trays holding as many as 60 tumblers each, lifted and carried by the patient. Diagnosis (April 15th, 1915): Cardiac hypertrophy.

To my mind this is a simple case of occupational heart disease, since there was nothing in the history to point to a valvular disease as the cause behind the hypertrophy. This hypertrophy for a time was physiologically compensatory, but the girl was beginning to show the effects of circulatory exhaustion. As remarked by Sir Thomas Oliver, the expression 'so tired' is an expression which should never be heard from any worker at the close of his or her work day, since it signifies exhaustion. Would workers but heed this symptom, many more of our people would be with us until three score years and ten, instead of dying suddenly, sometimes between forty and sixty years of age, from what the community chooses to call 'sudden heart failure.' In truth, there is nothing about most of these cases which should be considered sudden at all. The underlying causes have been at work, as a rule, for years. I will not discuss the deaths due to valvular heart disease, since the gradual compensatory hypertrophies which take place are fairly well understood, and the reasons for the final appearance of the symptoms of decompensation are also fairly well understood by the medical profession. Obviously, all persons so handicapped should have their vocations carefully selected for them, and they should be given the benefit of frequent physical examinations to determine whether they are not overdoing. This is being gradually recognized in certain industrial centers, particularly in New York and Cincinnati, in the former of which a trade school for cardiacs has been established. In connection with the Norton Company, of Worcester, Mass., it is important to note that the careful selection of work for those suffering with recognizable forms of heart disease among their employes has resulted not only in the deferring of cardiac mishaps, but, it is believed, in an actual betterment of the heart diseases themselves. This is to be accepted as a physiological phenomenon, and in keeping with some of the well-recognized methods of treatment for heart diseases. Any who have had clinical experience, or opportunities in an industrial center, and particularly in connection with dispensaries or hospitals, know with what frequency the valvular heart case returns for treatment, each time due to an over-stress or strain, invariably in connection with occupation.

Mental workers do not appreciate at all that they are prone to sudden death from heart failure, particularly after the forty-fifth year of life. Illustrations of this, as noted above, are disclosed all around us every day. Strain and poisoning of intrinsic origin are unquestionably the factors at work with these also. There is a continual up-keep of an increased circulation to the brain, associated with what we believe to be a retarded or sluggish circulation through the eliminative organs. As is well known, this type of workers is also particularly prone to over-indulgences in food and drink. There is the same inclination to seek stimulants (coffee and tea must be



included here also) as we find among any class of workers who are subject to exhaustion. This particular class, because of the usual sedentary character of the occupation followed, is least able to digest, assimilate and eliminate such forms or degrees of food consumptions. A peculiar thing, however, is that the appetite with the mental worker appears out of proportion to his caloric or intrinsic requirements. In fact, physiologists inform us that mental work does not require additional caloric replenishment. It is a great question in my mind whether a large number of these cases of apparently sudden cardiac deficiency, particularly among mental or sedentary workers, is not due to extrinsic poisoning. Some of this may be in the nature of stimulating extractives and concentrated portions in our 'civilized' forms of diet, which our conventions force upon us, while who can say how much of it may not be due to caffeine, theine and theobromine in our common drinks, and to pyridin bases and other toxic principles in tobacco, to say nothing of the stronger stimulants and narcotics which are so universally used.

While stress-and-strain heart disease is unquestionably the chief form of this malady, and valvular heart disease is an exceedingly important entrant as well, to which stress-and-strain adds its finishing touches, there is a relatively small class that is much more occupational in character than either of these. We have not yet come boldly out with the declaration of 'occupational heart disease' for any forms of the malady, but this term comes nearest in its application to those illustrated in the following instances:—

CASE III.—*Tobacco Heart*. (The following is reported by a physician practising in the vicinity of a large tobacco plant.) This girl suffers from nausea and indigestion. She is anemic. She has cardiac irregularity and evidences of lack of muscular tone. In the course of a necessary operation she took the anesthetic very badly, becoming practically pulseless and ceasing to breathe. By profession she is a packer in the tobacco factory. Her case is typical of many others of this type of workers whom it has been my experience to treat.

CASE IV.—*Angina Pectoris and Arteriosclerosis*. General painter, *æt.* fifty-four, United States. History of several lead poisoning attacks, and a hospital patient recently for what he termed 'lumbago.'

CASE V.—*Myocarditis and Chronic Interstitial Nephritis*. Painter, *æt.* fifty-nine, German. Found to have worked in a sign shop for years. Close confinement, doing a great deal of sandpapering of painted surfaces, and to have had several acute attacks of plumbism during the past thirteen years. (Died after eighteen days in hospital.)

We will not get upon a definite basis for curtailing this enormous percentage of sickness and death due to heart disease in the prime and pre-senile decades of life until we investigate very closely the industrial relations and pursuits of our patients. We will not be able to do this either until we adopt a closer inquiry into the health-

hazards of these pursuits at our various charitable and private treatment institutions, as well as in our individual practices. Indeed, I would go one step further and declare that no marked improvement will be noted in this direction until the American dollar has been injected into the solution. By this means chiefly can we deal with the practical American. Practically all of these heart conditions can be demonstrated by the careful clinician even years before demise takes place. In other words, they can be demonstrated when they are *primary conditions*, otherwise known as *occupational diseases*. Of course, it would be foolish not to recognize that moral hazards, habits and other exigencies of our civilized state are also factors, but for this class of diseases the form of occupation must be considered paramount in causation and (or) promotion. The idea of extending sickness insurance to all classes of workers in gainful occupations appears to be the only real solution in any preventable disaster to health. Our social insurance advocates declare that from the great success which compensation for accidents and injuries has attained in many states in this country, we should at once adopt this plan of sickness insurance, leaving the details to be worked out by various states, although it would appear that from the very first the expenses of keeping up the same should be equally borne by the employer, the employe and the state itself, from which each would of necessity do all in its respective field to prevent health disasters.

This situation should be looked into most carefully: 36 per cent. of the agricultural classes in the Registration Area of the United States reach seventy years of age, while but 13 per cent. of those engaged in the various trades and callings (including professions) reach that age.

#### SUMMARY.

1. Deaths from heart disease, preeminently senile in character, are occurring with astonishing increase in communities where statistics are to be given the most credence.

2. Three forms should be recognized etiologically: (a) The stress-and-strain form (mental or physical), (b) the valvular disease form, (c) the toxic form.

3. In each of these the victim's occupation is a vital factor. Because we do not go into the health-hazards of industrial applications we fail to recognize this vital relationship.

4. It is evident that the most plausible solution for all diseases of preventable character is the adoption of schemes for compulsory sickness insurance, at least for all persons in gainful occupations. Thus the question of compensation for occupational diseases would be included, and disputes concerning the true character of the same would be beside the point.

IDIOPATHIC HYPERTROPHY OF THE LEFT VENTRICLE;  
ITS RELATIONSHIP TO STATUS THYMO-LYMPHATICUS.

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Cases of idiopathic hypertrophy of the left ventricle are not very common. They are spoken of in foreign literature as '*juvenile herz hypertrophie*' and '*hypertrophie de croissance*.' They have not to my mind been adequately explained. A case which recently came under my observation, and which showed the external manifestations of so-called constitutional inferiority, has led me to the assumption that these cases may properly be termed representatives of the condition now designated status thymo-lymphaticus. Before proceeding, I should like to give a brief history of my case.

CASE I.—William H., *æt.* twenty-one, elevator operator. Single.

*Family History.*—Mother is a typical cardiorenal case. One sister suffers from chronic valvular disease.

*Previous History.*—Measles. Scarlet fever and mumps in childhood. Never had rheumatism, tonsillitis, or chorea. Was operated on for fistula in ano ten years ago and cured (done under general anesthesia). At fourteen began to grow rather rapidly and found he did not have the endurance of his playmates. Never could compete in sports with them. Two and a half years ago, wanted to enter the U. S. Navy, but was rejected on account of 'heart trouble.' He does not have the strength which he should possess. He has dyspnea on exertion, attacks of palpitation, and occasional 'dizzy spells,' some pain in his toes, no true intermittent claudication, no nocturnal polyuria, no cough. Appetite is good. Bowels fairly regular.

*Habits.*—A moderate drinker, denies venereal disease, smokes occasionally.

*Physical Examination.*—Patient is tall (6 ft. 4 in.), head and face small. The beard growth is very scanty; axillary hair meagre, and pubic hair female in type. Pupils: The right larger, both round and react to light and to accommodation. Throat: Mucous membranes of fair color; some hypertrophy of the tissues of the posterior pharyngeal wall; tonsils not enlarged. Teeth fit poorly, *i. e.*, in closing the teeth, wide gaps are seen between the two maxillæ laterally. Palate is high-arched. There are a few palpable lymph-glands in the neck, especially on the right side. The neck is long. No abnormal pulsation seen. Lungs negative. Heart: Apex beat in the sixth space outside the mid-clavicular line, heaving in character, no thrill; first sound is booming; no murmurs. Pulmonic second is loud. The radial artery is small and soft. Blood-pressure 106 systolic, 70 diastolic.

Abdomen shows moderate right-sided nephroptosis; tenth rib is floating. Dorsalis pedis shows normal pulsation.

Urine shows sp. gr. 1020, no albumin, no sugar, no casts.

Blood smear shows a relative lymphocytosis—persistence of the infantile blood picture? vagotonus? Differential count shows: Polymorphonuclears, 60 per cent.; lymphocytes, large and small, 37 per cent.; eosinophiles, 2 per cent.; basophiles, 1 per cent.; hemoglobin, 80 per cent.



The testes were small. The fingers showed tendency to clubbing. The x-ray showed typical drop heart (*Tropfenherz*). The ophthalmoscopic picture was normal. The neurological examination showed nothing abnormal. The sphygmogram was normal.

Both in the clinical history and in the findings the cardiovascular apparatus played the chief rôle. There was no evidence of valvular disease, atherosclerosis, chronic nephritis, or hyperthyroidism. There was no history of over-exertion, nothing in short to account for this idiopathic hypertrophy of the left ventricle. In view of the presence of signs of status thymo-lymphaticus we concluded that we were probably dealing with a case of congenital hypoplasia of the aorta and its branches, with consecutive hypertrophy of the left ventricle—not a stenosis of the aortic orifice, but a narrowing of the entire arterial tree. The patient did not show the pseudo-anemia which most of these cases evidence to a marked degree. This pseudo-anemia is due to poor peripheral circulation. In some cases the heart is small (hypoplastic). The patients are delicate, show evidence of retarded development. The health remains fair until adolescence comes on. Many of the cases of chlorosis belong in this group. They show a predisposition to infectious fevers. The cardinal and diagnostic points, according to Maude Abbott,<sup>1</sup> who quotes Van Ritook, are youth, pseudo-anemia, early fatigue, low temperature in fevers (lack of good reaction to infection), palpitation, hypertrophy of the left ventricle, actual insufficiency of the heart after slight exertion, and diminished resistance to disease. Our patient presented most of the stigmata cited. We feel safe in designating this case as one of status thymo-lymphaticus with symptoms and signs of vascular hypoplasia.

I should like, in this connection, to amplify this phase of the subject in view of the large literature which has accumulated on the subject of status thymo-lymphaticus. Pediatricists had used the term 'lymphatism' to denote an inferior constitution characterized by pallor, muscular weakness, hypertrophy of the lymphatic tissues, and a tendency to exudative affections of the skin and mucous membranes (exudative diathesis of Czerny). It was Paltauf (1889) who first spoke of the relation between persistent thymus and sudden death. He spoke of a lymphatic chlorotic constitution, and gave as its stigmata the persistent thymus, hypertrophy of the lymph-follicles at the base of the tongue, a general enlargement of the lymph-glands, an enlarged spleen, hypertrophy of the lymphoid tissue in the gut, and frequently hypoplasia of the cardiovascular system and of the genitals. His contention was that sudden death in these cases was not due to mechanical compression of the trachea by the large thymus, but to cardiac and respiratory paralysis. The calibre of the vessels was narrow, their walls thin, and to quote the inimitable Neusser, "The effect of added strain on the heart of such an

individual, especially if the coronaries are narrow or the bundle of His poorly nourished, must be patent. Possibly a diminished blood-supply to the vital centers in the medulla might be responsible for the sudden deaths reported in these individuals."<sup>2</sup>

The manifestations of status thymo-lymphaticus in children and in the adult vary. The condition sometimes occurs in families. I know of a family in which the father died of premature atherosclerosis at forty-nine. Two of the surviving sons are typical cases of status. In children with this anomaly, there seems to be a tendency to sudden death, following a minor operation, for example, an antitoxin injection (possibility of anaphylaxis playing a rôle), puncture for paracentesis, etc. The child may be found dead in bed. The symptoms are those of rapid asphyxia. The most vulnerable age is between six and sixteen months. The children are usually supernourished. If the superior vena cava is compressed we may get cyanosis; if not, pallor is the rule. There is no hoarseness, thus differentiating the condition from intralaryngeal anomalies. There is no cough, which excludes bronchial gland tuberculosis. There is a certain amount of inspiratory stridor.

The diagnosis may be made by the bronchoscope. The thymus may be palpable in forced expiration, *e. g.*, crying. Percussion of the manubrium may give dullness, especially to the left of the sternum. We must be careful, however, to exclude enlarged mediastinal glands. The enlarged thymus may be masked by a voluminous lung, and hence, may be found only on roentgenologic examination. This should be made a routine procedure. We find the shadow of the large thymus superimposed on the cardiac area and extending to both sides of the sternum, especially to the left. This shadow moves up in expiration and down in inspiration.

In the adult it is difficult to separate status thymicus from status lymphaticus. We therefore speak of status thymo-lymphaticus. Here also we may get sudden death during mild anesthesia, following severe emotion, insolation, or attempts at coitus, and in the bath, especially if forced and associated with fear. Patients become pale or cyanotic, convulsions or coma supervene, and the pulse becomes feeble and irregular. These individuals bear narcosis badly. The enlarged thymus does not seem to be so important in the adult as in the child, and if present, must be differentiated from intra-thoracic struma and mediastinal tumors.

Status thymo-lymphaticus may be found in the aged; not all need to succumb in early life. The individual may withstand narcosis and disease, as was the case in our own patient. The anatomical changes may be found at post-mortem only, but usually there are certain suggestive findings. We find heterosexual characteristics, a tendency to obesity (hypophyseal dystrophy?), anomalies in the distribution of hair, in the structure of bones (male pelvis in

women). In the male we may find aspermatogenesis, tendency to gigantism or dwarfism, unusually long arms and legs, fatty deposits in the region of the mammæ, lower abdomen, thighs, and buttocks, female pelvis, rounding out of thighs and arms, beardless face, scant hair in axilla, on trunk and extremities, female type of pubic hair, high-pitched voice, lack of prominence of Adam's apple, small penis and testicles. In females there may be exuberant growth of hair on upper lip, chin beard, scant hair over mons veneris, mannish voice, flat chest, narrow hips, hypoplastic internal genitals with consequent sterility, premature menopause, and irregular menses. There usually is hypoplasia of the vascular system, dilatation and hypertrophy of the left ventricle due to over-activity of the heart. The peripheral vessels are frequently indurated, due to hypertrophy of the media—a vicarious attempt to maintain a normal circulation.

Status thymo-lymphaticus is frequently associated with the habitus asthenicus of Stiller (witness our own case). Many cases of Basedow's and Addison's disease show the stigmata of status thymo-lymphaticus.

The chromaffinic system\* is hypoplastic. As a result there is a deficiency of adrenalin in the blood, with a consequent diminution of vasomotor tone. The vessels cannot functionate properly, hence added burdens for the left ventricle. This hypo-adrenalinemia, however, has not been definitely proved, for adrenalin determinations in the blood are of doubtful value. The amount in circulation is not an accurate index of the activity of the chromaffinic system. Besides, there are a lot of adrenalin-like bodies in the blood, whose presence impairs the value of these determinations (O'Connor).

On the other hand, the thyroid is said to increase the effect of adrenalin on blood-pressure; hence the so-called increased adrenalin content in Basedow's disease (advanced as an argument against the existence of a hypoplasia of the chromaffinic system) is not proved. It might be explained as a sensitization of the sympathetic system to adrenalin; hence a plus effect even without a normal chromaffinic secretion. Eppinger and Falta have shown that after the extirpation of the adrenals, phloridzin glycosuria was less marked, the mobilization of sugars through adrenalin being absent. So, too, cases of status do not show or show to a less extent the adrenalin glycosuria; hence they postulate the hypoplasia of the chromaffinic system. Neusser cites the case of a woman with osteomalacia in whom the injection of adrenalin produced no glycosuria and no rise in blood-pressure. He, too, concluded that the chromaffinic system was hypoplastic.

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\*Chromaffinic system includes the medulla of the adrenals, the carotid gland, the coccygeal gland, and many cells scattered throughout the sympathetic system (the so-called adrenal system).



Eppinger and Hess believe that vagotonus has a definite bearing on status thymo-lymphaticus. They cite the increased perspiration (Neusser), the eosinophilia and the marked respiratory arrhythmia.\* Cappelle and Beyer, by the injection of atropine in cases of Basedow's disease, produced a fall in the number of lymphocytes and eosinophiles in the blood. They therefore assumed the existence of a vagus element in this condition. The injection again of thymus or thyroid *press soft* caused a rise in the number of lymphocytes and eosinophiles. Most cases of status showed a relative lymphocytosis; hence they assumed a certain relationship between status thymo-lymphaticus and vagotonus.

Hypertrophy of the cortex of the thymus is part of the anatomical picture of status thymo-lymphaticus and the most recent hypothesis (Matti<sup>3</sup>) is based on the assumption of an auto-intoxication taking origin from the thymus, together with injury to the cardiac and vascular neuromuscular apparatus. Matti speaks of a hyper- and a dysthymisation—the latter being a term used to denote the abnormal secretion of an apparently normal gland. The cases of sudden death are probably due to diminished efficiency of the chromaffinic system, especially the medulla of the adrenals. Under added stress, an inefficient cardiovascular apparatus with diminished tonicity gives out readily. Narcosis, especially with chloroform, leads to impoverishment of the blood in adrenalin; hence there is added danger where the adrenal system is hypoplastic.

The prognosis in these cases is, as a rule, not good, yet some reach old age, just as castrates with a large thymus may attain longevity.

The treatment where a large thymus causes mechanical obstruction consists of resection of the gland. Usually therapy is of no avail.

In conclusion, I might say that while the condition called status thymo-lymphaticus is not a definite clinical entity, the stigmata which characterize it may help us to diagnose properly. They seem to point to a disturbance of function of the glands of internal secretion. It remains for the medicine of the future to unravel the relationships existing between them, and to assign to each one of these important organs its place in the human economy.

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<sup>1</sup> Osler's Modern Medicine, Vol. 4, p. 419.

<sup>2</sup> Zur Diagnose des Status Thymico-Lymphaticus. Wien. 1911.

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<sup>4</sup> Emerson (*Archives Int. Medicine*, 1914, p. 169).

\*I might say, by way of parenthesis, that childhood is a good example of vagotonia. Note the lymphocytosis, the marked respiratory arrhythmia, the ease with which children perspire especially during sleep, the frequency of enuresis (overactivity of the detrusor urinæ which is innervated by the autonomic pelvici), and finally the so-called tolerance for atropine. With reference to the last, I would rather say that children require relatively larger doses of atropine to obtain therapeutic results on account of the vagotonia present.

A CASE OF FRIEDLANDER'S PNEUMONIA WITH  
RECOVERY.

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By CHARLES HUNTER DUNN, M. D., of Boston,

AND

JOHN HAMMOND, M. D., of Boston.

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J. L., *æt.* fourteen and a half months, was admitted to the hospital on October 12th, 1914. He was referred to the hospital by the nurse in charge of the Lawrence City Mission for observation, as to the possibility of empyema or some chronic lung condition, on account of a persistent cough.

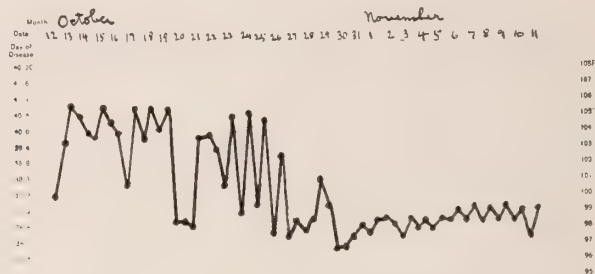
The history sent with the patient stated that the father and mother are well, and that there have been no other children and no miscarriages. The baby was born at full term after a normal labor. He was never breast-fed, but was fed on the bottle and gained well until early in April, when he had a severe attack of pneumonia. Following the pneumonia, empyema was suspected and the chest was tapped, but no pus could be found. He continued to have some fever every afternoon until the end of May, when he seemed perfectly well. About the 20th of June he had bronchitis, which left him with a cough, which continued until the middle of August. Since the middle of August he has had no cough and has been gaining in every way. He has been outdoors continually. Yesterday, on October 11th, he was seen by the nurse of the Lawrence City Mission for recurrence of cough which had just come on.

On admission to the hospital the patient's temperature was 100.5° F., pulse 100, and the respiration 40. Physical examination showed a well-developed and nourished boy. His intelligence seemed somewhat below the normal for his age. His skin was clear, his cranium was well-shaped, and the anterior fontanel was level, measuring 2 by 2 cm. The eyes were normal, and the pupils were equal, and reacted normally. There was no nasal discharge, and the tongue and mucous membrane of the mouth were normal. There were two teeth. The throat was reddened but there was no exudate. Examination of the ears showed the right membrana tympani red and bulging, and the left membrane somewhat reddened. The chest was symmetrical, with equal expansion on both sides. Examination of the lungs showed nothing abnormal to auscultation or percussion. The heart was normal in size and position, the sounds were regular. The abdomen was full but not tense, tympanitic throughout. There was no tenderness, and nothing abnormal felt. The spleen was not palpable, and the liver was not enlarged. The genitals were normal. The extremities were normal, and the reflexes were normal. The von Pirquet cutaneous reaction for tuberculosis was negative. The white blood count was 22,000. Examination of the urine showed nothing abnormal. Paracentesis was done on both ears. From the right ear bloody pus was obtained. From the left ear no discharge was obtained.

On the evening of October 13th the temperature rose to 106° F. The ears were discharging freely, and physical examination failed to disclose any cause for the rise of temperature. On October 14th the temperature was 104 to 105° F. The respiration had risen to 60, and the patient looked decidedly ill. Examination of the lung at this time showed an area of dulness in the mid-scapula region in the posterior axillary line. Over this area respiration was

slightly bronchial in character, with a few fine râles at the end of the inspiration. A radiogram of the chest was taken, which showed an area of consolidation in the left lower lobe. On October 15th the dulness was more marked in the left posterior axillary region, with distant bronchial breathing, and numerous fine moist râles. On October 17th the signs of consolidation had extended throughout the axilla. On October 9th there was dulness and bronchial breathing with numerous fine and medium moist râles over the entire left lower lobe. During the night of October 19th there was a critical fall of temperature to normal. The pulse and respiration showed very little tendency to fall at this time. The temperature remained normal until the evening of October 21st, when a fever of 104° F. was again recorded. Examination of the lungs on October 22nd showed the same signs over the left lower lobe, but in addition there was dulness over the left upper lobe both in front and behind, with distant slightly bronchial breathing and a few fine râles.

At this time, on account of the recurrence of fever and the extension of the dulness over the upper lobe, thoracentesis was performed. No fluid was obtained from the pleural cavity, the needle entering the lung. On withdrawing the needle, a small amount of fibrinous material was found in the lumen of the needle, and from this cultures were taken. After forty-eight hours on blood agar, a pure culture was found of a Gram negative capsulated bacillus. This



organism corresponded morphologically and in all cultural reactions to the *B. mucosus capsulatus*. The white blood count at this time was 15,000.

The patient continued to run an irregular temperature until October 30th, when the temperature went to subnormal. There was a gradual fall in the rate of pulse and respiration. On October 23rd, the lower lobe of the left lung began to clear, normal resonance and respiration returning to the axillary region. On October 26th, the left lung was clear except for dulness over both the upper and lower lobes behind. On October 27th, a second thoracentesis was performed, and the same organism was obtained in pure culture. From this time on the consolidation of the lungs gradually cleared up, the lungs being found clear on November 2nd. The patient was kept in the hospital under observation until December 12th, showing no further symptoms. He was then discharged well. He has since been followed through the Hospital Social Service Department, and is reported well at the present writing.

This case clinically presented the features of a lobar pneumonia, first of the left lower lobe with crisis, and then a reinfection in the left upper lobe. It was apparently a case of Friedlander's pneumonia.

Pneumonia due to *B. mucosus capsulatus* has been frequently reported, but very few cases have been recorded in children, and none



to my knowledge in infants. The diagnosis in adults is usually made from sputum examination or at autopsy. The fact that few cases are recorded in early life is probably due to the difficulty of making proper sputum examinations in children, and to the infrequency with which permission for autopsy is obtained.

As far as I know, every recorded case of Friedlander's pneumonia has been fatal, and it is generally regarded as a fatal form of pneumonia. It is for this reason that the present case of recovery from Friedlander's pneumonia is reported.

## MECHANICAL VIBRATION IN DIAGNOSIS.

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A mechanical vibrator is more often looked upon by the average practitioner as a necessary but rather useless piece of apparatus to be operated as a toy or applied in an indifferent manner to meet an end not yet met by other measures, or to appease the patient's desires or feelings—in other words as a placebo without consideration of its real merits.

Mechanical vibration, like any other measure, physical or mechanical, covers a special field in medicine, trespassing on diagnosis and being particularly adapted to selective conditions yielding to massage.

As an aid to diagnosis it is invaluable to the general practitioner. Mechanical vibration determines:—

1. The presence and site of inflammation and pain.
2. The degree of tissue irritability.
3. The presence and degree of muscular spasm.
4. The range of mobility of a joint by lessening the tension.
5. The state and degree of efficiency of various reflex functions.

In the examination of a patient, all or one or more of the following examinations should be made, depending upon the conditions suggested relative to the case disclosed by the patient's history or methods of diagnosis other than mechanical vibration: (1) An examination of the back; (2) an examination of the spine; (3) an examination of an organ; (4) an examination of areas of tenderness; (5) an examination of muscles.

After examining the back by observation, as with the patient sitting with the hands on the knees, and noting conditions as to symmetry, the presence or absence of atrophied muscles, the relative position of the spinous processes, collectively and individually, have the patient lie in the prone position with the arms hanging downward on each side to increase the width of the interscapular space, with the head turned toward the side to be vibrated, which position lessens normal muscular tension. The operator then applies the disc vibratode to the muscles of the back to elicit tenderness, which is marked by the presence of contracted muscles and by involuntary muscular contractions when the vibratode is applied. Pathological conditions may also be manifested by muscular atrophy as well as by muscular contraction, and a relaxation of interspinous ligaments, which causes may make the spinous processes more or less promi-

nent or depressed. These conditions are found in the region of the posterior primary divisions of the spinal nerves coming from the segment or segments of the cord supplying the affected organ or part.

If a region of the back reveals tenderness on the application of the disc vibratode interruptedly, the nerve-supply of that part should be investigated, and when located, its associated spinal segment should be vibrated in the intervertebral spaces with the ball vibratode, and the parts supplied by the sympathetic fibres associated with the involved spinal nerve root should be examined for local tenderness, which if found might be reflex or primary and solve the problem under consideration, or lead to further investigation, as to the cause of the tenderness of the organ or part supplied by the corresponding nerve. For example, pain and tenderness may be elicited in the epigastric region associated with trauma of certain muscles of the back. Tenderness of the back may be associated with trauma, sprains, lesions of spinal ligaments, vertebral displacements or fractures, or arise from compression, concussion, rheumatoid arthritis, neurasthenia, nephritis, herpes zoster, cystitis, calculi, spinal cord disease, visceral affections, tuberculosis, or hysteria, in each of which the presence of tenderness requires special consideration for differentiation of the cause.

After an examination of the spine has been made by inspection and palpation, the ball vibratode is employed for the detection of sites of intervertebral tenderness. If there be certain deviations or deformities below the cervical region, as due to pleurisy, growths, aneurysm, trauma, suppurative, tubercular, or malignant processes, an examination of the chest will be indicated. Consider the vertebræ in respect to situation, singly and relatively, and their relation to spinal nerves and segments when studying elicited spinal pain.

The following is a convenient guide for locating definitely the respective spinous processes of the vertebræ (Gray) : The 2nd cervical is felt in the pit of the neck by deep pressure; the 7th cervical is the vertebra prominens; the 3rd dorsal is on a level with the commencement of the spines of the scapulæ, the roots of the scapulæ being often marked by a dimple; the 7th dorsal is on a level with the inferior angles of the scapulæ; the 4th lumbar is on a level with the highest part of the ilium.

Preparatory to a spinal examination, the patient assumes the prone position on a table having a resisting surface. The arms should hang downward on either side so as to widen the interscapular space and to relax the back muscles. The clothing having been removed, place the second and first finger-tips of the left hand on two contiguous spinous processes, and, holding the vibrator handle in the right hand, apply the ball vibratode in the intervertebral



spaces, first on the right side, then on the left side, raising the index finger of the left hand out of the way, the second finger of said hand remaining as placed. The second finger is then moved to the site occupied by the first, just as the first is moved to seek the spinous process of the next vertebra below. The thumb and index finger of the left hand are thus ever ready to steady the vibratode or to modify the severity of the vibration, as is always done over the bony surface of the sacrum. The fingers of the left hand afford a guide both as a sense of touch and location. The whole spine is thus examined for points of tenderness and muscular tension.

Spinal vibration, thus applied, determines the presence and sites of tenderness or pain which are indicative of the causes of the spinal irritability, or, reflexly, of the irritability of an associated organ or part, as of the liver or stomach. If the parts are hypersensitive, or if the delicate spine of a child is to be examined, a soft rubber cup-shaped vibratode may be used instead of the hard ball.

When examining the spine it is well to recall that diseases of the cervical region may reflexly refer pain to the upper limbs, diseases of the dorsal region to the upper limbs, chest, or body, as in heart and stomach disorders; diseases of the dorsolumbar region to the leg or foot; and disease of the lumbar or sacral region to the lower limbs or abdomen. Intervertebral tenderness elicited by vibration will oftentime cause pain or a contraction similar to that of which the patient complains in a distant part. Elicited pain or tenderness should be considered in connection with conditions of which a patient complains, or which are revealed by inspection or palpation, or from the effects of vibration as affecting other parts, adjacent or peripheral, one or both. When the ball vibratode is applied to a sensitive spinal site, a muscular spasm is often elicited. Such a place when vibrated is found to be sensitive, due to tension of the overlying muscles which may be indicative of a local lesion.

Rarely is it necessary to determine whether the sensitiveness is real or simulated. If such occasion arises apply Mankopff's or Loewi's sign, descriptions of which are as follow. Mankopff's sign: Take the pulse-rate before, during, and after pressure is made on the sensitive area. If the pulse becomes increased in frequency, it is a proof that the pain is genuine. Loewi's sign: Dilatation of the pupil is in direct proportion to the intensity of the pain. According to Abrams, in neuroses the spine is not rigid at the sensitive sites. The disc vibratode applied interruptedly over the glutei and along the sacro-iliac synchondroses may elicit pain or tenderness, which makes the operator look for signs of Goldthwait's disease or tuberculosis in a case of supposed sciatica, in which case Goldthwait's tests or a radiogram are necessary.

A bilateral vertebral tenderness in the dorsal region will help to differentiate a visceral trouble from intercostal neuralgia which

has three points of tenderness, vertebral, mid-axillary and sternal.

The nerve segment corresponding to the affected nerve is usually sensitive. Both the site of origin and site of exit of the involved nerve are usually tender. Arnold thought that the indications corresponded to the exit of the spinal nerve and not to the location of the segment of the cord. Our practice confirms his findings, but occasionally tenderness may be elicited at both sites.

In connection with prognosis, the following is cited. If when the patient complains of pain in the hips, spinal vibration elicits tenderness, especially a bilateral tenderness in the lumbar region, and vibration with the disc vibratode or the static wave current over the glutei elicits pain in the obturator and crural nerves, as well as over the sacro-sciatic notch, the prognosis is not so favorable as if pain were elicited only over the sacro-sciatic notch. The elicited pain means a pelvic involvement which may be due to a fibroid, adhesions, tuberculosis, or a prostatitis, instead of a neuritis at the notch. A pelvic examination and sometimes in addition a radiogram will be necessary to determine the diagnosis.

Spinal reflexes elicited by mechanical vibration, the sinusoidal current, static wave current, polysine, static spark, a high frequency modality, or concussion are of importance diagnostically and therapeutically. The response of these reflexes normally varies with the agent employed.

The heart reflex of contraction is elicited by a spinal vibration between the seventh cervical and the first dorsal vertebræ for not longer than two minutes. The contraction, according to Abrams, will be absent in pericardial effusions.

If vibration, applied in the intervertebral spaces from the second to the fourth dorsal vertebra, does not lower the blood-pressure, but vibration in the intervertebral spaces alternately on each side, between the seventh cervical and first dorsal vertebræ, does lower the blood-pressure, it demonstrates that cardiac weakness is associated with the high blood-pressure, for such vibration tones up the heart.

Vibration is valuable in the diagnosis of aneurysm as well as in treatment, when used as Abrams discovered with the concussor. If the transverse dullness at the level of the manubrium exceeds the normal about 5 cm., either dilatation or aneurysm is present. Vibration in the intervertebral space between the seventh cervical and first dorsal vertebræ will diminish the area, and when applied in the intervertebral spaces, between the ninth, tenth, eleventh, and twelfth dorsal vertebræ, will increase the area, and if an aneurysm, will aggravate the aneurysmal symptoms.

The lung reflex of dilatation is elicited by vibrating in the intervertebral spaces from the third to the eighth dorsal vertebra. If absent posteriorly, Abrams regards it as an early sign of pulmonary

tuberculosis. The stomach reflex of contraction may be elicited by vibrating with the ball vibratode in the intervertebral spaces from the first to the third lumbar vertebra. If a sensitive area or growth be moved upward through the contraction of the stomach, resulting from vibration between the first and second and second and third lumbar vertebrae, and the sensitive area or growth afterwards returns to its former site, its association with the stomach is demonstrated, as noted by Abrams.

Pelvic headaches, according to Garrigues, may be associated with pain (1) at the fourth and fifth lumbar vertebrae, the spinal center for the internal pelvic organs, or (2) on either side of the second sacral vertebra due to a cellulitis of the utero-sacral ligaments.

In the examination of an organ, interrupted vibration with a disc vibratode, employing varying degrees of pressure, in accordance with the patient's tolerance, is used. The vibratode should be applied gently but firmly, and the pressure gradually increased sufficiently to elicit pain if present. A sensitive appendix, or ovary, gall-bladder, pylorus, or congested liver, kidney, spleen, stomach, or painful intestinal condition is revealed through the use of the disc. Painful sites on the chest posteriorly or anteriorly are often elicited, as in cases of asthma, pulmonary tuberculosis, intercostal neuralgia, and brachial neuritis. In gastric affections, vibration from the mid-dorsal region down to the ninth dorsal vertebra will elicit tenderness and often cause eructation of gas.

Vibration also demonstrates the presence of hyperalgesia. Cutaneous expression of visceral disease, as noted by Head, should be considered. These sensitive areas on the surface "correspond to spinal segments from which the posterior roots take their origin and not to their peripheral distribution. When two areas are centrally connected, pain is referred to that area which is relatively more sensible."

The tenderness or pain elicited by the use of the ball vibratode as a means of spinal examination, and the disc vibratode for other parts require a careful interpretation, and the diagnosis and prescribed treatment will be determined on findings as a whole. Many times obscure conditions are revealed, as bilateral interscapular tenderness, which would be suggestive of pulmonary tuberculosis, before any marked signs are present. A radiogram should then be made, which, as a rule, confirms the suspicion. These cases do not yield to ordinary methods of treatment as indicated by the pain. Nerve tenderness may also require interpretation, as when pain or tenderness is elicited between the sixth and seventh, seventh and eighth, and eighth and ninth dorsal vertebrae on the left. It means that the exits of the sixth, seventh, and eighth dorsal nerves on the left side are affected, which condition may be associated with a



pathological state of the stomach. Hence a radiogram and other examinations of the stomach are made necessary.

Muscles should be examined for tension and response with the disc vibratode. Interrupted vibration should be applied over the particular site in question to determine also whether the tension is of local or reflex origin. In this examination a disc vibratode is employed. Spinal vibration with a hard ball vibratode may also be used for testing the muscle reflexes. According to Gowers, a spasm caused by reflex action is usually produced in the legs and trunk, "the flexor spasm seems to be due to an over-action of the centers for cutaneous reflex action, the extensor spasm chiefly to that of the centers for muscle reflex action," although a cutaneous impression might indirectly excite it.

Mechanical vibration, like most useful measures, has a limited field of application, but in that it merits adoption by the general practitioner both as a means of diagnosis and for treatment.

2020 Broadway.

## SPECIAL ARTICLE.

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"SOMEWHERE IN FRANCE."\*

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By RALPH L. THOMPSON, M. D., of St. Louis.

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London at night is like a city of the Middle Ages, dark except for the great flashlights which are thrown out to catch the Zeppelins. The wives of some of the men who went over in our party had to get respirators to stay there. The hoardings are covered with posters, posters of every kind, urging men to enlist.

Every building almost of any importance, almost everywhere in Europe, is now turned into a hospital. The casinos and hotels at the big watering places are hospitals.

From England we crossed the Channel and went over to France. The Channel is fenced off by a sort of chain network supported by buoys, and transports follow along here with aeroplanes flying overhead, with the big war balloons watching in every direction, with submarine destroyers floating about you, so that you really feel that you are of considerable importance.

On the western battle front, at Etaples, is the hospital with which I was associated. This hospital is situated on the coast of France, on the Channel, about fifty miles back of the fighting line, and, more particularly, back of that well-known, almost unpronounceable town of Ypres, which the Tommies commonly call 'Wipers.' This district, with a number of those towns which are mere villages of which you have heard so much in the recent drive, was the territory which fed us, and we were there most of the summer without very much to do, waiting for the big drive to take place.

Before last February, the section of France where I worked was a mass of sand dunes. The vicinity of Etaples, however, has been the seat of conflict from time immemorial. From behind our hospital could be seen the embankment of an old Roman camp. Napoleon camped here when he was considering the invasion of England early in the nineteenth century. And here our hospital unit, together with thirteen other units, was built on one of the sand dunes.

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\*Stenographic notes from an Address before the St. Louis Medical Society, October 16th, 1915.

Everything in the war on the British side is in units of a thousand. Now I would like to say here that I am talking here about the British Expeditionary Force, because I was with the British Expeditionary Force. We went over not to aid the Allies, but to aid humanity. I believe there is not a single man in the whole unit but would have gone as quickly on the German side as on the Allies' side; and if I talk more about one side than the other, it is simply because our medical work was done in this particular place. Being with these people, after we were placed with the hospital, we were in uniform, and were not a part of the American Red Cross, but officers of the British Expeditionary Force.

Around the village of Etaples there were fourteen hospitals, each of a thousand beds. About fifteen miles back, at Boulogne, there were eighteen hospitals, each of a thousand beds. If you went immediately into the French war zone, there were any number of French military hospitals. So convoy trains coming in with five or six hundred wounded were just simply licked up so quickly that they did not mean anything at all. They are prepared in this zone to take care of thousands or hundreds of thousands of wounded and sick soldiers; enough for the kind of fighting that we have been reading about recently. Moreover, they are prepared to take care of that sort of fighting for the next ten or fifteen years.

There are various types of hospitals. There are the ordinary tent hospitals; there are the so-called 'hutch' hospitals. The hospital in which I worked was one of these 'hutch' hospitals. They are wooden buildings lined with asbestos board. They are absolutely permanent. The operating rooms are as well built as they would be in any of our modern hospitals. Through these camps run better roads than we have in the state of Missouri. They are built, as I say, so that they will be good for years to come.

Now, we were what is called a Line of Communication hospital. This is, perhaps, going a little into technical detail. I would like to say a few words about how the wounded are handled. First, at the front, comes the stretcher bearer, who goes out and picks up the wounded on the field. The soldier has a little first-aid package sewed into his coat, which comes with every uniform, a little gauze, a little tincture of iodine, so that he may apply a first-aid dressing himself, or this may be done by the stretcher bearer, who has a similar package and can provide this first aid. But usually nothing special is done. The wounded man is taken back to the so-called dressing station, a dressing station of the first order, and there a better first-aid treatment can be given. Perhaps he is taken back to a dressing station of the second order. All of these three different types of dressing stations are found along the front. They move along with the fight.

Having been given what aid is necessary, the wounded man is



then taken back to a large hospital which may be ten or even twenty miles back, a so-called collecting hospital. All the cases pass through these collecting hospitals. They are immobile units and tremendous numbers of patients are cared for and much surgical work is done in these hospitals. All perforating wounds of the abdomen, etc., are handled there. Patients who are going to die within a short time are not sent anywhere else. Patients who are so badly maimed that they will never be fit to fight again are sent back to England; and other patients who have to be treated, but not so immediately—those who are slightly wounded and can eventually be sent back to the fighting zones—are sent on to the lines of communication hospitals. Now, as many as a thousand patients a day frequently pass through one of these thousand-bed hospitals.

At Etaples, as I say, we were one of the lines of communication hospitals, and we received the patients sent down from the collecting hospital by convoy train. These convoy trains are very modern things, very well constructed. Some of these trains cost as much as \$150,000. There are surgeons and orderlies on the train and they give whatever dressings are necessary, and then at centres like Etaples, usually at night, in the flare of big acetylene lamps, these convoy trains are unloaded onto ambulances; and we stood on the hilltop waiting for these ambulances to come up. There are usually four stretchers in an ambulance. You get every kind of thing you can think of, as far as wounds can go, but all is not horrible by any manner of means. I have seen these big 'rubberneck' wagons, which are common here for various purposes, coming up with a load of wounded soldiers looking as happy, far more happy perhaps, than wagonloads of Cook's tourists that I have seen driving about London or Paris in times of peace.

Now, are these hospitals any good? The most surprising thing to me was the quickness with which we got patients well in these hospitals; and this was in a great measure due to their simplicity and to the fact that they were practically open-air institutions. Moreover, there is the matter of what you might call the esthetics of war, or of hospitals, to be considered here. We not only attempted to treat the wounds in these hospitals, but to treat the men. Here were these poor devils who had been in the trenches for months,—we had many of them who had been at the front for eleven months,—and they came in tremendously fatigued. I have seen men sleep for forty-eight hours at a stretch. You can operate on them without using anesthetics. I have seen these men come in in their dirty, stained, mud-caked uniforms. The uniform is taken off and burned; that is the end of that. The men are put into porcelain bath-tubs, given a hot bath, and then they are given a complete, new uniform of hospital clothes.

Here begins what you might call the esthetics of hospital treat-

ment. The men are given a hospital suit of very brilliant blue, with a white shirt and a big, flaming red necktie, so that they may have a color scheme to amuse them when they wake up. Moreover, the nurses do not dress merely in white, as they do with us. They all have some color to their uniforms. The British nurses wear a gray uniform trimmed with bright red. The Canadian nurses wear a very handsome shade of blue—I am not up on colors, but it is very pretty—with brass buttons, shoulder straps and all. Our nurses wore a pleasing variation in brown as the chief background of the color scheme. The Harvard Unit nurses wore dark blue.

Then everything possible is done for the men's comfort. In our own country, when we go to the hospital, we are treated in the most inhuman manner one can imagine. You say 'hospital' to a person and it makes him sick, if he is not sick already. Any little pleasure or comfort that one has ever been accustomed to in his life immediately ceases on his entering the hospital. If he has been accustomed to smoking a little now and then, that pleasure is denied him the minute he comes into the hospital. If there is some little particular delicacy that he is fond of, the physician immediately finds out what that is and suppresses it. In the French war zone we gave a man what he wanted. I have seen a man with one side of his face shot away, paralyzed on one side, smoking a cigarette on the intact side and enjoying it; and, strange to say, you would see that man recover and leave the hospital. It is a very curious fact that notwithstanding these comforts, the men get well.

If we would apply the treatment to our patients in our hospitals here that is applied in the war zone, we would save all of the hospital days that have been lost by the people who are involved in this great war. We could get back all of this loss that we have been experiencing in the war as far as people in hospitals are concerned.

And if you could walk through the smells of the little fishing village of Etaples, as we did every day, you would say that if France would apply to her towns the sanitation that is compulsory in camp and hospital she would save in the next generation as many lives as this war has cost.

# MEDICAL AND SURGICAL PROGRESS

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## THE PHYSIOLOGY OF LACTATION.

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### A REVIEW OF RECENT LITERATURE.

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By HUGO EHRENFEST, M. D., of the Editorial Staff.

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1. Adler (*Muench. med. Wochenschr.*, 1912, No. 1).
2. Basch (*Deutsch. med. Wochenschr.*, 1910, Vol. XXXVI, May 26th).
3. Below (*Monatsschr. fuer Geburtshilfe und Gynaekologie*, Vol. XXXVI, p. 679).
4. DeLee: Principles and Practice of Obstetrics, 1915, p. 216.
5. Foges (*Wien. klin. Wochenschr.*, January 30th, 1908, Vol. XXI, p. 137).
6. Frank (*Archiv fuer Gynaekologie*, Vol. XCVII, p. 183).
7. Herrmann (*Monatsschr. fuer Geburtshilfe und Gynaekologie*, January, 1915, Vol. XLI, p. 1).
8. Kehrer (*Archiv fuer Gynaekologie*, 1910, Vol. XC, p. 169).
9. Liepmann: Handbuch der Frauenheilkunde. 1914.
10. Lindig (*Zeitschr. fuer Geburtshilfe und Gynaekologie*, 1915, Vol. LXXVI, p. 726).
11. Mackenzie (*Quart. Jour. Phys.*, 1911, Vol. IV, p. 305; quoted from *Jour. Amer. Med. Assoc.*, March 2nd, 1912, p. 639).
12. Miller (*Archiv fuer Gynaekologie*, Vol. CI, p. 568).
13. Niklas (*Monatsschr. fuer Geburtshilfe und Gynaekologie*, Vol. XXXVIII, Ergaenzungsband 6).
14. Novak (*Zentralbl. fuer die ges. Gynaekologie*, Vol. IV, p. 49).
15. Pfaundler (*Zeitschr. fuer Kinderheilk.*, 1911, p. 191; quoted from *Jour. Amer. Med. Assoc.*, March 23rd, 1912, p. 860).
16. Polano (*Muench. med. Wochenschr.*, 1907).
17. Schaefer (*Medical Press*, March 1st, 1913; abs. *Amer. Jour. Obstet.*, Vol. LXVIII, p. 590).
18. Schickele (*Zeitschr. fuer Geburtshilfe und Gynaekologie*, Vol. LXXIV, p. 332).
19. Sigwart (*Zeitschr. fuer Geburtshilfe und Gynaekologie*, Vol. LXXIII, p. 297).
20. Steinach (*Zentralbl. fuer Physiologie*, Vol. XXVII, p. 717; quoted from *Jour. Amer. Med. Assoc.*, February 21st, 1914, p. 618).

The intense and rather general interest recently shown in the intricate problems of internal secretions has of necessity led to a most careful study of the obvious relations of the mammary glands to en-



doocrine glands. The results of these investigations we now possess in the form of a definite advance of our knowledge concerning lactation, but also in the shape of innumerable hypotheses and theories. It is as yet impossible to write a comprehensive physiology of mammary function. An attempt, however, to survey recent important work along these lines and to outline present views as shaped by this work would seem justifiable if not actually desirable. One will readily agree with Niklas that the question of the causes of milk secretion and a study of the conditions under which the mammary gland normally becomes active, is not only interesting from a mere theoretical point of view, but actually is of eminent practical importance.

The large material to be considered seems best presented, as done by Niklas, under the three main headings of mechanical, nervous and chemical causes of lactation, especially since such an arrangement permits the consideration of the literature almost in its chronological order.

#### MECHANICAL CAUSES.

Some of the oldest theories assume that the large quantities of blood, which during pregnancy flow to the uterus for the benefit of the fetus, are after the expulsion of the fetus deviated towards the breasts for the benefit of the newborn child. Halban has argued most convincingly against these and similar explanations. The extirpation of large sanguineous uterine tumors would have to produce the same result. Especially the experiments of Grigoriu Cristea have definitely disposed of such theories. Rats and rabbits joined by operation show that in such parabiotic animals, when only one becomes pregnant, in the other also the *mammæ* secrete milk. In the absence of a noteworthy communication between blood-vessels in these animals, the possibility of a transmission of a large amount of blood from the one to the other is excluded. Recent observations on the Blazek sisters (pyopagig twins), so carefully described, *e. g.*, by Schauta or Basch, have finally established the unreasonableness of such a theory also for the human being. Aschner and Grigoriu furthermore have demonstrated that forced hyperemia produced by suction with a Bier cup never leads to secretion.

#### NERVOUS CAUSES.

For the purpose of this review it will suffice to mention only the many and apparently successful attempts to disprove the existence of special secretory nerves for the mammary glands, often described in older literature.

Normal lactation has been observed after the resection of all afferent nerves, after destruction of the lumbar section of the cord, even after complete destruction of the cord down to the cauda equina, and also after separation of the breasts from the sympathetic system by means of resection of the hypogastric plexus or the celiac ganglion (Niklas). Transplantation of the extirpated breasts into the ear or to the back of the animal (*e. g.*, Basch) has failed to interfere with a normal function of secretion after the termination of pregnancy at term. Halban also mentions the analysis made by Routh and Mercier of cases recorded in litera-

ture, in which fractures of the vertebral column sustained during pregnancy had caused a complete severance of the spinal cord, apparently without influence on mammary function after birth. All these experiments on animals and observations on the female tend to prove a marked, if not absolute independence of the secretory function of the breast glands from the central nervous system. Niklas in this connection also quotes the experiments of Grigoriu with parabiotic animals. They seem to furnish a convincing proof against all the theories of lactation based on the assumption of secretory nerves in the breast.

The existence of a reflex relation between nipples and uterus cannot be denied, but it has been shown, in that most exhaustive study of the problem by Kehrer, that the nipple does not possess any specific degree of sensibility for starting such a reflex irritation of the uterus. It also has been pointed out by various writers that while such a centripetal stimulation of the uterus from the breasts is possible, no proof ever has been advanced for the possibility of a centrifugal stimulus running in the opposite direction towards the breasts.

The problem, however, becomes somewhat obscured by the evident effect of nipple irritation, either artificial or natural (suckling of child or milking) on the functioning mammary gland. It will be desirable to emphasize here the necessity of differentiating clearly between the effect of any of the assumed causes, mechanical, nervous or chemical, on an inactive (virginal) or an actively functioning gland. This point will be of special importance later in the discussion of the chemical causes. It will be shown that stimulation in general must be divided distinctly into one factor which results in hyperplastic growth and activation of the mamma and a second factor starting the specific secretory function, *i. e.*, milk production.

Experiments and observations made on animals and in certain instances on the human being, concerning the possibility of producing a flow of milk from the breasts through persistent nipple irritation, independent of pregnancy, have yielded contradictory results. Thus, for instance, Cramer has recorded success, while Aschner and Grigoriu have failed in their attempts. This difference may find its explanation in the fact, not considered by all experimenters, that in animals during heat the breast glands (as in the human during pregnancy) are temporarily activated. Nipple irritation may be effective in producing actual secretion in the activated gland, but probably never can achieve this result in the inactive gland. Nipple irritation, especially in form of sucking, proves, however, uniformly effective on the lactating gland. This has been usually ascribed to a hyperemia produced by the irritation.

Another explanation has recently been offered by Pfaundler: The activated breast has acquired a natural tendency, more or less constant, to secrete milk, but it can translate this tendency into actual function only if secretions filling the milk ducts are removed by the sucking of the child. The removal of the formed milk increases the milk flow by relieving the distended organ and thus removing an obstacle to further secretion. The increased milk flow after vigorous sucking, therefore, is not the result of nipple irritation, but is solely due to the removal of an artificial inhibition.

There remains one more argument for the possibility of a ner-

vous cause of lactation—namely, the occasionally striking effect of mental influences. Again it must be acknowledged that such influences will affect either favorably or unfavorably only the lactation process after it has been actually established.

Therefore, all recent observations and investigations have fairly forced upon us the conclusion that neither mechanical nor nervous causes offer any acceptable explanation for the establishment of the normal secretory function of the breasts subsequent to the expulsion of the fetus.

#### CHEMICAL CAUSES.

Chemical substances acting as specific stimulants apparently can reach the mammary glands only by way of the blood-vessels or lymph-ducts. This fact now seems indisputably established by the experiments of Grigoriu or the observations on the Blazek sisters. It had been assumed by older writers that the nutritive material contained in the blood and during pregnancy used for the benefit of the growing fetus, after the expulsion of the fetus is eliminated through the breast in the form of milk. Such explanations, however, can easily be refuted by various clinical observations. In the present status of our knowledge concerning internal secretions it seems most plausible that certain endocrine glands produce specific hormones which incite the secretory function of the breast glands.

During the past few years the efforts of all investigators in this particular field have been concentrated on two questions, (1) Which of the glands endowed with internal secretion produce these hormones? and (2) Is it possible to isolate such hormones?

Three of the possible sources of such hormones obviously are (1) the ovary; (2) the ovum (fetus and placenta); (3) the mamma itself.

1. *Ovary*.—At three stages of the reproductive period in the life of woman, the various parts of the sexual system exhibit marked effects of a growth impulse: at puberty, during menstruation, and during pregnancy. The dependence, at these times, of the growth of the uterus and, especially, of the breasts, upon ovarian function is to-day rather generally acknowledged. Therefore, the obvious conclusion has been drawn that the specific breast stimulation, resulting in milk secretion, originates also in the ovary. In general, this represents the prevailing view. But even if correct it would not solve the problem of lactation. A stimulating force furnished by the ovary at puberty or during menstruation and pregnancy finds its expression solely in the growth of the mamma, *i. e.*, in hyperplastic changes of the glandular tissue. These changes undeniably play an important rôle, but cannot be regarded as the deciding factor in the process of lactation which is characterized by milk secretion, a function not observed at puberty or during menstruation or in the course of pregnancy. Thus it is evident, as already pointed out, that etiologically we must differentiate strictly between a growth impulse and a secretion impulse. Secretory activity of the breast must be dependent either upon a specific hormone different from the growth hormone, or is brought about through the exclusion, after delivery, of certain hormones which at all other times inhibit milk production. But this problem became still more complex after it had been found that there are in the ovaries at least three structures which might be regarded as the sources of various



hormones, some presumably regulating the development and growth of the sex organs, others determining the development of the secondary sex characteristics, or causing the cyclical changes of the endometrium leading to menstruation, and possibly still others inciting the secretion of milk. The utter impossibility of a definite solution of the problem of lactation at this time finally becomes apparent if we consider the undeniably existing close interrelation of all endocrine glands in the body in the form of (1) cooperation, (2) antagonism and (3) vicarious assumption of function by other glands if one of the important glands has become inactive or has been removed (*e. g.*, for the purpose of experiment).

It is especially this last mentioned fact which has rendered the value of much of the solely experimental work in these problems exceedingly doubtful.

(a) *Growth of Breast Glands.*—If, as has been stated in the foregoing, mamma growth at the time of puberty, and temporary increase in the size of breast glands during menstruation, apparently is due to specific ovarian function, then we seem forced to the conclusion that the characteristic hyperplasia of the mamma in the course of pregnancy must also be the result of stimulation by ovarian hormones. The justification of such a conclusion always has been denied by those writers who claim to have found the origin of such growth hormones in other organs than the ovaries. Halban has thus collected notes from the literature concerning castrations performed early in pregnancy, apparently without any interference with later development and secretory function of the breasts. Similar observations have been recorded by others, *e. g.*, Sigwart. But in the discussion of Sigwart's paper, Zinsser pointed out that he personally knows of 3 such cases in which milk secretion after delivery could not be established in spite of all attempts. Observations similar to those quoted by Halban probably only prove that exceptionally the removal of all functioning ovarian tissue, even early in pregnancy, does not necessarily preclude normal lactation after labor.

Almost without exception we find the view expressed among recent writers that the typical hyperplasia of the mammary glands during pregnancy is dependent upon ovarian function, most authors regarding the corpus luteum as the particular structure supplying this growth hormone.

The problem of mammary growth is thoroughly discussed in a paper by Schickele. He shows that Halban's arguments are not convincing. Ovarian function undoubtedly continues during pregnancy also, though certainly in a somewhat modified form. In the case of the Blazek sisters, the non-pregnant one continued to menstruate. Many observations have been recorded to prove a continuation of the menstrual wave during gestation (*e. g.*, by Fellner or Merletti). All that actually stops during pregnancy, at least as a rule, is that particular part of functional activity of the ovaries which is closely related to the cyclical changes in the endometrium causing the flow. Schickele emphasizes that animal experiments in this respect are misleading, and, therefore, of necessity are yielding contradictory results. The injected animal extracts in experiments with a positive result may not have acted directly on the breast glands themselves, but may have passed to the uterus, fetus, or other glands with an internal secretion which influence the

breast glands. Schickele assumes that, in general, ovarian function during pregnancy is not essentially different from its function at puberty or during menstruation.

Basch concludes, from his own experiments, that the growth of the mammary glands is effected entirely by substances originating in the ovaries. The identical claim has been made by Foges. Miller is convinced of the correctness of Fraenkel's theory concerning the growth stimulation exerted on the breast glands by the corpus luteum.

In a short paper, Frank discusses the experiments of Aschner and Grigoriu Cristea, and also those of Basch, and refers to his own investigations. Milk secretion is the most obvious phenomenon of mamma function, but secretion is dependent upon mammary growth and especially upon the development of the alveolar component of the gland. The chief problem, therefore, is the specific stimulus which leads to the hyperplasia of the breast glands. The flow of milk itself in this problem is only of secondary importance. In the experiments carried out by him with Unger, the fact seems to have been established that the stimulus for growth is supplied by the ovary and chiefly by the corpus luteum. In a mamma activated in this manner milk secretion can be started by various, possibly even by non-specific stimuli.

We thus come to the discussion of the next question: Does the ovary also supply a hormone initiating the discharge of milk from the activated gland?

(b) *Secretory Function of Breast Glands.*—The fact that glandular growth under ovarian influence at the time of puberty or during menstruation occurs without the secretion of milk, and that the latter phenomenon appears only after the expulsion of the products of pregnancy, permits only two explanations, if in this connection we consider only the ovary as the possible source of such specific hormones: (1) The specific secretory stimulus is supplied by the ovary only after labor; (2) at all times, except after labor, the production of the growth stimulating substance in the ovary is accompanied by the production of another specific hormone which exerts an inhibitory effect on the secretory function of the mammary glands.

In general, the opinion seems to prevail that such a specific, secretion-stimulating or secretion-inhibiting hormone more likely originates either in fetus or placenta, a point to be discussed in detail later on. That the ovary itself, however, may play a rôle in this part of the problem cannot be absolutely denied at present. Some experimenters record the production of typical lactation, even in virginal animals, obtained by the injection of ovarian extracts. Mention already has been made of the undoubtedly valid argument advanced by other investigators, that these positive results probably have been obtained only when the breast glands were temporarily activated (*e. g.*, during heat). The removal of both ovaries in lactating animals seems not only to benefit the milk flow, but also to lengthen noticeably the duration of lactation—a fact well supported by the experience of breeders, especially in cows and goats. This observation really suggests the existence of an ovarian hormone which inhibits secretion. But the most important information concerning the influence of the ovaries on milk secretion has been furnished quite recently by the experiments of Steinach and Holzknacht.



Steinach has found that when the transplanted ovaries form a firm foothold in his 'feminized' male animals, the development of the typical secondary sex characteristics are actually accentuated. Thus the rudimentary mammary organs may develop to a stage characteristic of the pregnant female—they may begin to secrete milk in abundance. He reports instances in which such feminized males actually suckled young animals. In some newer experiments carried on in cooperation with Holzkecht, Steinach now has gone even farther. They attempted to stimulate the ovary of the normal virgin female by means of roentgen rays to imitate the overactive transplanted ovary. By a suitable exposure to  $x$ -rays they actually succeeded in obtaining the characteristic phenomenon of lactation, with simultaneous disappearance of all the virginal characteristics of the juvenile animal. It has been suggested, first by Starling, that the interstitial cells, found both in ovaries and testes, are the actual sources of those specific genital hormones which are responsible for the development of the typical sex characteristics (among them lactation). These recent observations of Steinach and Holzkecht, therefore, may be interpreted as supporting the views of Starling and others, since  $x$ -rays in a certain dosage do destroy the germ cells, both in ovaries and testes, but without affecting the interstitial cells.

The actual importance of the ovary in the secretory function of the breasts, therefore, cannot be definitely determined until we are better able to gauge the specific and probably biologically different activity of the various components of ovarian tissue, especially of lutein cells and interstitial gland.

2. *Fetus and Placenta*.—As a second possible source of hormones, stimulating breast growth or initiating milk secretion, we have to consider the growing ovum in the uterus, *i. e.*, either fetus or placenta, or both.

Writers, unwilling to accept the theory that the specific breast hormones originate in the ovaries, base their opposing views chiefly either on theoretical considerations and clinical observations (first collated most completely by Halban), or on the results of animal experiments in which breast development and active secretory function has been obtained, even in virgin animals, solely by means of injections of extracts made either from fetal or placental tissues.

It would be impossible, and probably superfluous, to give here in detail Halban's arguments against the ovarian origin and in favor of the placental origin of the specific breast hormones. While many of his solely theoretical deductions to-day seem definitely rejected, it must be acknowledged that his attitude against the ovarian theory, in the light of recent experiments, seems well justified, at least so far as the secretory function is concerned. These experiments in the main were arranged to study the phenomenon of lactation, invariably preceded by a hyperplasia of the gland. In discussing here the results of these experimenters, therefore, we shall not be able, though it would be desirable, to differentiate in this connection, as has been done in the previous pages, specifically between the stimulation of growth and the initiation of secretion of the mammary gland.

The fetus alone probably cannot be considered the sole source of these hormones, because the breast changes, typical for pregnancy, occur also in all cases of hydatiform mole, and in instances of long



retention of a dead fetus. In general, two objections have been made against the conclusiveness of apparently positive results with the injections of fetal extracts: (1) The breasts may have been in a state of temporary activation (*e. g.*, during heat), as already mentioned; or (2) fetal tissues may contain specific substances actually formed in the placenta (Basch).

Therefore, those who look to the ovum as the source of the hormones which are responsible for lactation, usually agree with Halban that they are produced in the placenta.

Keiffer (quoted from the paper of Novak) thought that a placental ferment, forced into circulation in larger quantities during labor, initiates the secretory function of the breasts. Hildebrandt assumed that placental hormones are stimulating gland growth, while at the same time are preventing the autolytic cell destruction essential for secretory function. This apparent antagonism between a growth stimulation and simultaneous secretion inhibition, on the one hand, and the sudden initiation of secretion without further growth, on the other hand, Biedl attempted to explain by his theory, that during pregnancy a hormone is produced, distinctly assimilatory in its action, therefore obviously inhibiting a function like lactation, which self-evidently is dissimilatory. The cessation of the production of this hormone will automatically cause dissimulation, *i. e.*, lactation. In the opinion of Novak, this theory of Biedl in general accords with the views of Halban or Hildebrandt. It must, however, be pointed out that in Biedl's opinion this hormone is formed in the ovary. The identical thought also has been expressed by Below: "Corpus luteum function during pregnancy furthers in the mother assimilation, chiefly retention of nitrogen and phosphorus, and effectively reduces dissimulation to prepare her for the greater demands to be made on her during lactation." He even suggests that some of this substance during pregnancy, and later during lactation, may be transmitted to the fetus or child respectively, and thus enhance the assimilating (growth) abilities of the latter.

While according to Niklas some of the earlier experiments of Starling apparently proved the presence of such a lactation inhibiting substance in placental extracts, later investigations showed beyond any doubt that neither fetal nor placental extracts ever possess the property of preventing secretory activity of mammary glands. In the present state of our knowledge it seems more probable that lactation is initiated not through the cessation in the production of an inhibiting factor, but through direct stimulation.

Basch probably was the first to obtain milk secretion by means of injections of extracts made from fetal and placental tissues. Since he himself, as already mentioned, acknowledged that the activity of fetal tissue presumably is due only to the presence of certain placental ferments in the fetus, we may be justified in the following to speak only of placental substances, although in some of the experiments only fetal tissues were employed. Basch thought that in his cases milk secretion was not accompanied by the preliminary growth of the mammary glands as typical in normal lactation, and, therefore, concluded that the growth itself is dependent upon ovarian influence, the actual secretion, however, on placental influence. Aschner and Grigoriu, and later Niklas, found in their experiments that at least microscopically the characteristic hyperplasia of the

acini can be demonstrated. The latter, therefore, concludes: "In the course of a normal pregnancy the growth stimulus originates neither solely in the ovaries nor solely in the placenta, but simultaneously in both organs. To a definite extent, in this respect one organ can vicariously take over the function of the other." The fact must be accepted as established that secretory function of the breast can be obtained by means of injections of placental extracts. But even in the opinion of Niklas this fact does not prove the specificity of placental extracts, at least not in animals whose glands once before had been active. He agrees with Frank, Aschner and Grigoriu that in such animals every 'leuco-stimulant,' *i. e.*, lymphagogue, also acts as effective lactagogue. Niklas observed that lactation, artificially procured in this manner, will last only a limited time, but that it can be quickly obtained if placental extracts are introduced directly into the circulation by means of an intravenous transfusion. This particular observation induces him to the deduction that the theories of Keiffer and others probably are correct, according to which milk secretion is started as the result of the introduction of large quantities of specific placental hormones into the system effected by the compression of the placenta during labor. Niklas states that these substances probably are albuminoid in character, are destroyed if heated above 56° C., but are not harmed by short exposure to alcohol. Novak, in critically discussing the results of the various experimenters, remarks that undeniably many facts of highest interest have been discovered, but that the results of experiments and certain clinical phenomena never will be successfully harmonized until the chemical identity of these extracts has been established. In this respect one of the latest contributions to the subject probably will prove most valuable.

Herrmann, in a careful analysis of the work of the various investigators, points to the very striking fact that positive results invariably have been obtained by those who have made their tissue extracts by the use of volatile solvents. More generally watery, alcoholic or glycerine extracts were employed, or the juice pressed out of crushed tissues. It was Iscovesco who first found that the lipoids, known to be present in all glands with an internal secretion, are biologically active. He extracted these lipid substances by means of a process in which among other solvents also, acetone, ether and chloroform were employed. Iscovesco ascertained that in their biologic effect, ovarian lipoids do not noticeably differ from the corpus luteum lipoids. Herrmann, appreciating the value of the work of Iscovesco, went still further in his efforts actually to isolate the active hormone, in his belief a lipid. He describes in his very interesting paper the rather complicated chemical process by which he finally procured a thick oily substance from corpus luteum and placenta. This oil was found to consist of carbon, hydrogen and oxygen and to represent a derivative of cholesterol. It is soluble in alcohol, ether, acetone and benzol, but insoluble in water. Most important seems the fact that the extracts in this manner obtained both from corpus luteum and placenta proved, not only chemically but also biologically identical in every respect. This substance is a most energetic stimulus for the development of all sex organs and also of the breasts. Underdeveloped rabbits, only eight weeks old, within five days after the injection of this extract, either from corpus luteum or from placenta, macroscopi-



cally and microscopically show all parts of the genital system, and also the breasts, in a state of development otherwise found only in animals twenty-eight to thirty weeks old. Further injections quickly bring these organs into a stage identical with that seen only during heat or in early pregnancy. The work of Herrmann, so far neither confirmed nor impugned by other investigators, proves a fact most interesting in the problem discussed in this paper: A substance, controlling the normal anatomical development and the specific hyperplastic changes of the mammary glands during menstruation and pregnancy, is produced both by the ovary in the corpus luteum and by the placenta. But, this substance, presumably an isolated hormone, apparently is unable to initiate the secretory function of the breast. Thus the work of Herrmann, in spite of its remarkable results, has not solved the question of lactation.

3. *Mamma*.—It is generally conceded that the mamma itself necessarily plays a definite rôle in the process of lactation. The quantity of milk secreted is markedly dependent upon the size of the breast glands. The absence of a secretory function after labor probably always is due to a deficient amount of mammary gland tissue. But these facts permit no deductions concerning the particular problem discussed here, *i. e.*, the causes of secretory activity of the breasts. The theory has been advanced that the mamma is also a gland with an internal secretion. Adler observed distinct alteration of the chromaffin system and interruption of pregnancy after the injection of an alcoholic extract of mamma tissue. Other investigators attempted to show that such mammary extracts represent that inhibiting principle which during menstruation or especially during pregnancy permits the hyperplastic changes without secretory activity. In general, however, one must agree with Fränkel, that none of the experiments is really convincing, that the injection of such extracts always represents the introduction into the system of a heterogenic and, therefore, toxic proteid, and finally that in the breast glands, tissues have never been discovered so far, which offer that histological picture which to-day is accepted as characteristic of all glands endowed with an internal secretion function. Most writers on the subject thus agree that it is hardly justifiable to count the mammary gland among the endocrine glands of the system.

4. *Other Organs*.—Novak refers to the various papers of Ancel and Bouin. These writers demonstrated the effect of the corpus luteum on mammary growth, but found in experiments on rabbits that lactation itself finally is dependent upon a specific stimulation from the so-called *glande myométriale endocrine*. This gland forms in the uterine wall in the course of pregnancy. Its existence is admitted by Keiffer and also by Fränkel, but its function is interpreted by the latter in an entirely different manner. A structure resembling the myometrial gland of Ancel and Bouin in the human being represents solely an accumulation of somewhat modified syncytial elements. Fränkel believes that this structure in the human can hardly be considered of any etiological significance for the starting of the secretory function of the breasts, because in woman lactation starts only three to four days after labor, because a typical lactation may be observed even after an early interruption of pregnancy, and also



after the removal of the pregnant uterus. In this connection it may be stated that DeLee in his latest work specifically refers to this striking difference between the human being and the animal. In the latter, the milk is present in the breasts within the first few hours—even during labor. In woman, secretion does not start until the second or third day. "This delay is possibly an outgrowth of civilization, in that the function of reproduction is not allowed such full play as formerly, and lactation especially has been neglected for generations, resulting in hypoplasia of the glands."

Ott and Scott, of Philadelphia, in 1910 reported that an extract from the posterior lobe of the hypophysis (infundibulin) has a very powerful lactagogue effect on the secreting mammary gland. More recently Mackenzie in Schaefer's laboratory found that of a great number of tissues examined only the posterior lobe of the pituitary, corpus luteum, pineal body, lactating mammary gland and involuting uterus give active extracts, and with the last two the results are inconstant. The pituitary extract is the most active, and it is active whether from lactating or non-lactating animals, whether from the same or a different species, and even when the hypophysis was taken from birds in which, of course, no galactagogue effect can be a natural function of the gland. These findings later have been confirmed by Schaefer himself, who believes that the largest quantity of the galactagogue hormones are supplied by the posterior lobe of the pituitary body, but also are yielded by the corpus luteum, by the involuting uterus, by the lactating mammary gland itself, and, perhaps, by other organs. "Hormones which are formed during pregnancy in the tissues of the fetus and placenta possess the property of inhibiting the activity of these galactagogue hormones." The undeniable effect of certain nervous influences on the secretory activity of the mammary glands, in his opinion, can only be explained either by the effect of such influences on general nutrition or "by their effect on the production and pouring out of such hormones."

Quite recently Lindig, in an article dealing with the pathology of secretions from the breast glands, pointed out that probably new light could be thrown on the problem of the physiology of lactation if more care would be taken in analyzing properly the not uncommon instances of a secretion from the breasts in non-pregnant and even virginal women. Such cases are often recorded in literature, and Lindig himself most interestingly discusses an apparent relation of tuberculous processes with such abnormal secretion from the nipples. He advances the theory that the introduction into the system of large quantities of split products of albumin as the result of extensive destruction of tissue, *e. g.*, in tuberculosis, carcinoma, or extensive burns, probably exerts a dissimulatory effect and thus may cause a secretory activity of the breast glands. This explanation of pathological secretion harmonizes well with some of the theories mentioned above, according to which, under physiological conditions, lactation is started as a proteolytic process initiated by placenta, fetus, ovary or the involuting uterus.

#### SUMMARY.

While in no manner complete, the foregoing survey of the most important contributions to the problem under discussion seems to justify a few deductions.

All animal experiments, however ingeniously planned, imply very many possible sources even of grave errors. The injection of organ extracts actually represents the parenteral introduction of alien proteids. Subsequent changes, *e. g.*, in the breast glands cannot logically be declared as the direct result of the injected substances, since the latter may have primarily affected some other glands, which in turn are only secondarily responsible for the observed breast changes. Thus the apparently striking galactagogue effect of pituitary body extracts may entirely or in part be dependent upon the faculty of such extracts to raise the blood-pressure. The rather general assumption of experimenters that the juice expressed from tissues or their watery, alcoholic or glycerine extracts represent or contain the specific hormones would hardly seem well justified. Animal experiments will have an unimpeachable value only after it has become possible actually to isolate the specific hormone, or probably the various hormones of each representative of the entire chain of endocrine glands in the system, a task which does not seem entirely hopeless if the latest work of Herrmann should be confirmed by other investigators.

In our present state of information we know that the physiological secretory activity of the mammary glands in form of lactation must be preceded by typical hyperplastic changes most pronounced in the acini. This stimulation of growth in all probability is chiefly effected by ovarian function. The specific growth hormone most likely is provided by the corpus luteum. A substance stimulating breast development is also produced in the placenta, but it seems possible (Herrmann) that this hormone is identical with a hormone produced in the corpus luteum.

It seems more likely that the beginning of the secretory activity of the hyperplastic mammary glands is the result of a direct stimulation than the result of the cessation in activity of special inhibiting hormones formed either in the ovary or placenta. The secretory stimulation of the activated breast glands is not necessarily specific. While in this respect the placenta possibly plays an important rôle, all lymphagogue substances, indeed all processes which stimulate lymph cell production may prove effective galactagogues.

## DIAGNOSTIC AND THERAPEUTIC NOTES.

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CARCINOMA OF THE BREAST.—Deaver (*Penn. Med. Jour.*, 1915, No. 1). All types of so-called benign tumors of the breast should be removed as soon as recognized. Deaver is convinced that every carcinoma of the breast takes origin from such a nidus of altered fibro-epithelial tissue, that there is an interval of time, sometimes weeks, often years, between the development of the primary benign lesion and its malignant transformation. In this interval, or in the very early stages of the malignant process, the stage when the cancer is not demonstrable clinically and often only in microscopic sections, in other words when the disease is a purely local one, operation will cure, not the occasional case, but every case.

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TREATMENT OF PNEUMONIA OUT OF BED.—Widmer (*Muench. med. Wochenschr.*, 1915, No. 21). After the first few days following the chill, the patient is made to sit up in a rocking-chair and is even permitted occasionally to walk a few steps. Usually four to six hours daily out of bed suffice. It is sometimes advisable to bandage the legs and abdomen.

This treatment, apparently somewhat brutal, is well borne by the patient and seems agreeable rather than otherwise. It is accompanied by a reduction of the temperature, ranging from  $0.5-2^{\circ}$  C., a diminution of the rate of respiration and a rise of blood-pressure. The patients sleep normally and do not become delirious. The rationale of the treatment is probably to be found in an improved lesser circulation and an increased activity of the reflexes. At any rate, empirically the method seems to have served the author well in 50 severe cases of pneumonia, all of which recovered.

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DIFFERENTIATION BETWEEN FUNCTIONAL AND ORGANIC CARDIAC DISTURBANCE.—Korach (*Berl. klin. Wochenschr.*, 1915, No. 20). In the differential diagnosis between functional and organic circulatory disturbances, the following points should be remembered:

1. The apex beat may be dislocated 3-4 cm. to the left without justifying the diagnosis of dilatation or hypertrophy. The dislocation may be due to an abnormally movable heart, such as is often found in neurasthenics, or to a transverse position of the heart.

2. In adults, functional murmurs may simulate mitral disease except that they are not accompanied by an accentuated second pulmonic sound. They are usually heard in the second interspace, just to the left of the sternum.

In young people, these murmurs are due to a close approximation of the pulmonary aorta to the chest wall. They may be produced by pressure with the stethoscope.



In children, functional systolic murmurs disappear on lying on the left side and are replaced by a split first sound. If, on the other hand, the murmur appears on lying down and disappears on sitting up or standing, then it is due to a real cardiac insufficiency.

3. An accentuated second sound, an enlarged liver, and a scanty concentrated urine signify a beginning cardiac insufficiency, often long before a dilatation can be made out.

4. Extrasystoles are due to abnormal irritability of the myocardium. Their prognostic import is the more serious the less they are felt by the patient, and vice versa. In cases with a low blood-pressure, moreover, their origin is usually psychic and their significance slight; if the blood-pressure is constantly over 160 mm., or if the difference between the blood-pressures taken lying and standing exceeds 20 mm., then the functional capacity of the heart is diminished.

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TREATMENT OF GASTRIC AND DUODENAL ULCER.—Fuld (*Zeitschr. fuer phys.-diät. Ther.*, June, 1915). Fuld puts his patients to bed, but does not insist upon their lying on their backs. That position should be chosen which is most grateful to the patient. When the ulcer is near the cardia, a semi-erect posture is usually chosen. Rectal alimentation is not always indicated. It increases the gastric secretion without furnishing any neutralizing substances. In mouth feeding, the food should be as bland as possible, soft, neither hot nor cold, free from extractives and condiments. Raw eggs, oils and mucilaginous vegetable substances are the most valuable articles of diet. Milk in large quantities is unsuitable, since the excess of gastric acidity causes the milk to fill the stomach with a thick, cheesy mass.

Medicinally, atropine and extract of belladonna are the best drugs for combating hypersecretion. The pylorus-spasm may be eliminated by anesthetizing the gastric mucosa. For this Fuld recommends either cocaine 0.015 grm. three times daily or isoamyl-hydrocuprein in 4 per cent. oily solution, a dessertspoonful several times daily.

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ALBUMIN TESTS.—Flesch (*Wien. med. Wochenschr.*, 1915, No. 16). Most of the errors, inherent in the various tests for urinary albumin, may be avoided by the following procedure:—

To 5 c.cm. urine add 2 c.cm. 5 per cent. sodium chloride solution and boil. Add 5 drops of 25 per cent. nitric acid or 1 drop 25 per cent. acetic acid. If the precipitate redissolves, it was due to phosphates; if it dissolve only after cooling, it was due to urates; if it persist, it was due to albumin.

## BOOK REVIEWS.

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THE ORIGIN AND NATURE OF THE EMOTIONS. Miscellaneous Papers. By George W. Crile, M. D., Professor of Surgery, School of Medicine, Western Reserve University, etc. Philadelphia: W. B. Saunders Company. 1915. Price, \$3.00.

One of the most difficult things for a reviewer to do is to estimate the value of a piece of work the spirit of which antagonizes his sense of scientific method. The intrinsic purpose of Crile's efforts forms so laudable an impulse that the weight of criticism naturally falls on his side. The mechanistic theory of the emotions is of itself so attractive that almost any fault of logic or thinking would seem insignificant. It is furthermore rare to find a surgeon who is interested in anything beyond the conventional collecting of clinical data or the consideration of the technical aspects of operative maneuvers. The reviewer's sympathies, therefore, are aroused in favor of this author and in support of the central idea of his book; yet in these essays of Crile's there appear to be so many evidences of inexactness of observation, so many faults of logical inference, that, in spite of a natural impulse to praise the effort, the reviewer cannot help but point out how far Crile appears to him to fail in working out his thesis. Apart from the idea of the phylogenetic aspect of fear and defense, which is at least an interesting conception, Crile relies for his evidence on certain appearances of the nerve cell to prove the material fact of his conception; that is, he takes a purely psychological phenomenon and finds certain histological variations in the assumed material origin of these emotions and then courageously draws the parallel between them and seeks to unite them in a chain of cause and effect. It is obvious that two things are necessary at least for this kind of reasoning; first of all the psychological conception must be absolutely sound, and the material findings must be without a shadow of criticism, but Crile with a rather naïve attitude towards the histology of the nerve cell, assumes that the nerve cell is the unit and at the same time the measure of the functional activity of the nervous system. He must be aware that there is a very serious doubt, as yet altogether unsatisfied, as to whether the nerve cell or the neurofibril or some other unknown substance may not be the integral psychological unit of activity. Until this primary question is nearer solution than it is to-day, no deduction in respect to the effect of various agencies as measured by the appearance of the nerve cell can be admitted. All proofs of such facts that are based upon one of the most uncertain of histological technical methods, the Nissl stain, form certainly a feeble foundation to base so large a conception upon.

Crile assumes that all emotions are primary and purposeful and are for that reason teleological as well for the individual as for the race. That the emotions are not all so simple as this must be apparent to the author, for it is assumed that he is surely aware that many psychologists are of the opinion that emotions are products of muscular activities or can be caused by them, and not causes of them, and further that automatically conditioned emotions probably exist, and further that these serve no purpose either to the individual or the race. It is probably known to him likewise that fear, pain, sorrow, and various other emotional reactions can be manifested by purely automatically conducted impulses originating in stimuli about the basal ganglia with no external contact whatever. This much the reviewer suggests to show, only in a rough way, how far afield Crile has permitted his surgical imagination to lead him. To explain so crude an exposition of a psychological puzzle, he has resource to the cruder proof—the appearance of the nerve cell stained by a most crude histological method, one that abounds in artifacts, and omits from his consideration of histological proof all other structures in the nervous system itself.

A word should be added concerning the numerous illustrations scattered throughout the volume, especially pictures of exhausted athletes, grinning and crying children, groups of children into whose facial reactions Crile would have us read various emotional expressions. Let the reader try what the reviewer himself attempted, that is, cover the descriptions at the bottom of the



pictures and see if anything like Crile wants one to see, can be arrived at by looking at these various photographs.

One wonders also at Crile's terminology—anger, pain, exhaustion are all regarded apparently as analogous states; that is, states of emotional purpose.

The reviewer has pointed out perhaps enough of what he considers to be the main faults of these ambitious essays to enable the reader to understand the spirit of his objections. Crile's work apart from the purely surgical aspect of this book must be considered crude, illogical, and unsatisfying. He has obviously looked at the subject of the emotions as he would look at a surgical problem, impatient at anything that escaped material proof. What one sees by the senses or some refinement of sensation, by modern instrumentality is all there is apparently in Crile's view even to so psychological an intrinsic thing as the emotions. The psycho-physical parallelism seems to Crile a satisfactory solution of one of the most subtle and intangible of all the phenomena of the mind. It is to be said further that nothing is proved by the mere force of insistence, enthusiasm, or eloquence, and truth must wait patiently until the time when our knowledge becomes amplified and our methods of investigation more delicate.

The essay by Jacques Loeb on "Mechanistic Science and Metaphysical Romance" would perhaps show Crile by what devious paths of reasoning and through what intricate byways the thorough scientific explorer winds his solitary way, and how tentative after all are the conclusions which are finally arrived at. No trace of this kind of scientific method can be seen in Crile's attempts to solve his problem, and for that reason if for no other many of his deductions leave the reader dissatisfied and disappointed; but when all these objections have been admitted, the value of Crile's essays are not to be denied. They form good reading, they are stimulating, and even a bit amusing owing to a certain ingenuousness which Crile assumes towards his problem. It is as though a problem is solved by making it easier than it is. That a surgeon should make this attempt is sufficiently exciting to merit praise, for it is a good omen for the future, that one of our foremost surgeons should so regard his problem as to see in it something more than a statistical representation of his activity and more than a collection of technical improvisations. The future of American surgery is made brighter and more hopeful by this book, even if no considerable advance in the theory of emotions can be said to have been made.

**A TEXTBOOK OF PATHOLOGY.** By Alfred Stengel, M. D., Sc. D., Professor of Medicine, University of Pennsylvania, Physician to the Pennsylvania and to the University Hospitals; and Herbert Fox, M. D., Director of the Pepper Laboratory of Clinical Medicine, University of Pennsylvania, etc. etc. Sixth Edition, Reset. With 468 Text Illustrations, Many in Colors, and 15 Colored Plates. Philadelphia and London: W. B. Saunders Company. 1915. Price, \$6.00.

During the course of nine years there may be much added to our knowledge of pathology, and therefore the revision of a student textbook on pathology after such a lapse of time becomes, not a matter of choice, but absolutely a matter of necessity. Hence, it is not surprising that the publishers and the original author should place on the market a new edition of this "Textbook." In this revision Stengel has been assisted by Dr. Herbert Fox, so that now the book appears with these two as the authors. It is interesting to note that neither of these men can be classed as pathologists, at least not as teaching pathologists. Stengel is to-day a clinician pure and simple, although his rise to his present position in clinical medicine is based on his fundamental knowledge of pathology, and Fox is the Director of the Clinical Laboratory connected with the Hospital of the University of Pennsylvania. This fact, instead of making for a handicap, should rather serve as a voucher that the relation of pathology and clinical medicine will be brought out more strongly than usual. This is true of the book in some degree, but the form of the older editions has been too closely adhered to to give as much scope to this very important aspect as should be given it. As a textbook for the student, it can be highly recommended; but it would have gained in value by a more thorough revision which would undoubtedly have changed its form entirely, and while adding but little new subject-matter besides what has been added in this sixth edition, would have given it a more up to date form, and have made much for the present-day efforts of medical pedagogy—namely, a better correlation of the fundamental branches and the clinical branches.

But there is no question that the contents of the book have been brought up to date, for we find included many things which have been published in recent



times. Excellent discrimination has been exhibited in inserting those matters which can be considered as definite, and excluding those matters which, while they may be of great interest and distinctly suggestive in character, cannot as yet be held to be proved; hence, the reader is not overloaded with suggestions and theories of a doubtful nature.

While there are evidences of careful revision throughout the book, in small additions here and there and deletions in some places, the major part of the editing is noted in the chapters on Inflammation, Retrogressive Processes, Disorders of Nutrition and Metabolism, General Etiology, and Diseases Due to Bacteria. A new chapter on Transmissible Diseases has been added, and there has been a rearrangement of some of the subject-matter, so that there are now separate chapters on Teratology, the Glands of Internal Secretion, and several chapters on the Diseases of the Organs of Special Senses. The omission of the chapter on technique has not lessened the value of the book, as special books on this subject are usually consulted.

The illustrations of the previous editions have been used in most cases. The newer ones added to this edition are, however, distinctly superior to some of the older ones, but a further revision of some of the plates would certainly add to the value of the book.

**DIARRHEAL, INFLAMMATORY, OBSTRUCTIVE, AND PARASITIC DISEASES OF THE GASTRO-INTESTINAL TRACT.** By Samuel Goodwin Gant, M. D., LL. D., Professor of Diseases of the Colon, Sigmoid Flexure, Rectum, and Anus at the New York Post-Graduate Medical School and Hospital. Illustrated. Philadelphia: W. B. Saunders Company. 1915. Price, \$6.00.

It is always a hazardous task to write a textbook about a symptom, particularly when that symptom is common to a great many diseases. It is not surprising, therefore, that the present work, while it contains excellent material, presents much of it in a scattering manner with not a little repetition. But the most disappointing feature of the book is the chapter on examination and diagnosis. That a textbook which deals exclusively with intestinal conditions should recommend, apparently as the method of choice, that sigmoidoscopic examination should be done with an obturated instrument introduced blindly without the guidance of the eye, is, to say the least, astonishing. "Force should never be used in the introduction of these instruments, otherwise there is danger of rupturing the bowel. The author has had one such accident . . ." The author is by no means the only one who has had such accidents, and it is mainly for this reason that the instrument has no place in a modern armamentarium. It belongs to the days when wounds were probed for bullets and whalebone bougies were pushed down the gullet to diagnose the nature of an esophageal obstruction. The pneumatic, illuminated sigmoidoscope, of which several good makes are on the market, is the only instrument whose use can be justified to-day. The x-ray as a diagnostic means receives scant attention. The Schmidt-Strassburger test diet is mentioned, but not in such a manner that the reader could employ it intelligently without reference to some other book. The diarrhea due to cancer of the large bowel, one of the more frequent causes of chronic diarrhea, and certainly one of the most sadly overlooked causes, receives bare mention. Nor can the reviewer have much sympathy with the author's stand on the question of the ipecac treatment of amebic dysentery. Contrary to the author's statements many clinicians can testify to its distinct and almost uniformly curative action and to the fact that when properly administered it does not cause nausea. Nor does the argument that the drug loses its potency in passing through the stomach and upper intestinal tract seem valid in the light of recent investigations. In all probability much or all of its action occurs through the blood-stream. In no other way can the benefit from the hypodermic use of emetine, both in dysentery and in amebic infections of the mouth, be explained.

**A TEXTBOOK OF DISEASES OF THE NOSE AND THROAT.** By D. Braden Kyle, A. M., M. D., Professor of Laryngology and Rhinology, Jefferson Medical College, etc. etc. With 272 Illustrations, 27 of Them in Colors. Fifth Edition, Thoroughly Revised and Enlarged. Philadelphia and London: W. B. Saunders Company. 1915. Price, \$4.50.

That the fifth edition of Kyle's treatise on "Diseases of the Nose and Throat" has made its appearance, speaks more eloquently than words for the continued favor with which the book is received. With the constant increase in our knowledge of the diagnosis and treatment of diseases of the nose and throat, frequent editions are necessary if a work can lay any claim at all to

modernity. We have come to look upon these increases in such a matter of fact way, that we are fairly startled when the author calls our attention to the recent advances in his preface—salvarsan, sphenopalatine ganglion neuralgia, and chronic hyperplastic ethmoiditis—not to mention a score of others. Perhaps it is only when our attention is thus forcibly attracted, that we realize the progress that is being made from year to year.

The volume is a veritable up-to-date compend and, as such, will be of great value to the specialist and the practitioner. For the student it is too voluminous. With our present crowded curriculum, no time is allowed for the complete perusal of a work of such magnitude, however valuable that may be. If left to himself to choose the more important chapters, it is not highly probable that the student's choice will be a wise one.

It is not possible to call attention to all the many excellences in the book. Among them, however, must be mentioned the many excellent microphotographs and photographs from anatomical preparations, as well as the differential diagnoses. Possibly a freer use of drawings to illustrate various operations would have rendered some of the description, in part, unnecessary.

We wonder, too, if, in the newer editions of a book, it is always necessary to repeat the descriptions of the older operations, many of which are obsolete and of interest only as they lead up to, or make possible, the operations in vogue at the present time. This thought occurs to us as we see described, in minute detail, some of the older operations on the nasal septum. Certainly the student, interested in them from an historical point of view, would experience no difficulty in finding them in some of the various older editions.

Not the least valuable part of the book are the concluding chapters on speech and voice defects. Usually these receive but scant mention in a work of this sort.

**MEDICAL DIAGNOSIS.** By Arthur Latham, M. A., M. D. (Oxon.), F. R. C. P. (Lond.), Physician and Lecturer on Medicine, St. George's Hospital; and James Torrens, M. B., B. S. (Lond.), M. R. C. P. (Lond.), Assistant Physician, St. George's Hospital and the Paddington Green Children's Hospital. With 74 Illustrations, 19 in Color. New York: The Macmillan Company. 1915.

The scope of this book is rather different from any of the usual works on diagnosis. The authors have combined the clinical facts with a discussion of the more useful laboratory details, grouping them under the various disease headings. Thus the volume is modeled along the lines of a textbook of medicine, emphasizing the clinical and diagnostic sides, and omitting or barely mentioning morbid anatomy, prognosis and treatment. They have been particularly fortunate in selecting the important laboratory procedures and in indicating the proper relative value between the various laboratory and clinical methods. Their rather implicit faith in the diagnostic value of the Widal reaction seems a bit unwarranted when one bears in mind the inconstancy in the time of its appearance and the technical pitfalls into which the unpracticed observer may fall.

In the diagnosis of hydrophobia, the authors seem unduly conservative in their views regarding the diagnostic value of the Negri bodies. In view of the importance which the determination of the blood-pressure has assumed, there is inexcusably brief mention both of its clinical importance and of the technique of its determination; a consideration of the diastolic pressure seems to have been omitted entirely. In the chapter on tuberculosis the material is particularly well arranged, being concise yet embracing the real essentials. There is likewise a most lucid chapter on cardiac arrhythmias, pulse tracings and electrocardiograms. In the cytodagnosis of serous exudates no mention is made of the significance of mitotic figures in those exudates due to neoplasms. The esophagoscope as a means of diagnosis is entirely overlooked. All in all the work will be found highly useful to the student and practitioner, and the original manner of its arrangement will make it unusually valuable as a handy reference book.

**THE DIFFICULTIES AND EMERGENCIES OF OBSTETRIC PRACTICE.** By Comyns Berkeley, M. A., M. D., M. C. Cantab., F. R. C. P. Lond., M. R. C. S. Eng., Obstetric and Gynaecological Surgeon to the Middlesex Hospital, etc. etc., and Victor Bonney, M. S., M. D., B. Sc. Lond., F. R. C. S. Eng., M. R. C. P. Lond., Assistant Obstetric and Gynaecological Surgeon to the Middlesex Hospital, etc. etc. Second Edition, with 302 Illustrations. Philadelphia: P. Blakiston's Son and Company. 1915. Price, \$7.50.

The volume, as indicated by its title, is limited to a discussion of the pathology



of pregnancy, labor and the puerperium, to serve "as a guide in plain terms to the practitioner when he is called upon to deal with the difficulties and emergencies that attend obstetric practice."

In many respects the writers have succeeded well in this task. The first fourteen chapters, considering the complication of pregnancy with general diseases and anomalies in the genital tract itself, probably contain more information than is offered in any other textbook, at least in the English language. The rest of the volume gives but little that is not found in every standard work on obstetrics. Indications and technique of treatment, especially operative, as set forth by these British authors, correspond as a whole to those generally advocated also by American writers. It must be emphasized, however, that the systematic presentation of the various subjects under definite subheads, such as: causes, diagnosis, prognosis, indications, etc. must prove a convenient and satisfactory arrangement for the practitioner who will turn to this volume for ready advice in a definite case. The American physician of necessity is greatly shocked by the all too frequent recommendation under "treatment" of some of the worst of ill-famed proprietaries,—Sanatogen seemingly being one of the particular favorites of the writers.

In conclusion it can be said that this volume forms a noteworthy and, in certain aspects, valuable, but surely not very remarkable, addition to our obstetrical literature.

**DISEASES OF THE NOSE AND THROAT.** By Algernon Coolidge, A. B., M. D., Professor of Laryngology in the Harvard Medical School, Laryngologist in the Massachusetts General Hospital. Illustrated. Philadelphia and London: W. B. Saunders Company. 1915. Price, \$1.50.

With the publication of Coolidge's "Diseases of the Nose and Throat," we believe that a work more nearly approaching the ideal textbook for the average medical student has made its appearance. While there are many excellent so-called textbooks on the market, most of these are too voluminous, and the student, with the excessive demands of the modern curriculum, has no time for their perusal. They are rather works of reference and fail utterly in their object as textbooks. Judged from this point of view, the present work is almost ideal, and we can offer few criticisms. "The small manual," says the author, "should be useful in presenting the different subjects in their proper perspective. The student should expect to get only general principles from his textbooks."

The book is of convenient size, and well printed and bound. The illustrations, though limited, are well chosen and illuminating. Possibly a few more could be added with advantage, without materially increasing the bulk of the book. The style is clear cut and incisive. In places it is almost epigrammatic. There are no superfluous words or padding. As an example, we quote the following: "The symptoms of nasal syphilis depend upon the local lesion. Infiltration causes obstruction; ulceration, a purulent discharge; and necrosis a foul odor. A true ulceration which is not acute in its course is rare from any other cause. Necrosis is even more so." We have read chapters in other books which did not carry so much meaning. Special attention should be called to the chapter on clinical history and the various references to differential diagnoses. Altogether, it seems to us the best book for the medical student which we have seen. Our only regret is that there is not in existence a modern work of similar aim and scope on the diseases of the ear.

**HUMAN PHYSIOLOGY.** By Professor Luigi Luciani, Director of the Physiological Institute of the Royal University of Rome. Translated by Frances A. Welby. Edited by Dr. M. Camis, Institute of Physiology, University of Pisa. With a Preface by J. N. Langley, F. R. S., Professor of Physiology in the University of Cambridge. In Five Volumes. Vol. I—Circulation and Respiration (1911); Vol. II—Internal Secretion, Digestion, Excretion, The Skin; Vol. III—Muscular and Nervous Systems (1915). New York: The Macmillan Co. Price, \$5.00 each.

In the making of physiological textbooks, we are at the parting of the ways. The physiologists of the past generation were brought up to know with familiarity all that had been recently done in physiological research, whether in vertebrates or invertebrates, in animals or in plants. The facts were not so numerous that they could not be stored in the memory without cumbering the judgment, and physiologists could in some sort be first-hand authorities on all branches of the subject. That condition has been gradually passing away, and it is hardly possible for anyone who is not of the old



school to write an advanced textbook covering the whole ground of physiology. Thus the textbook of single authorship is giving way to the textbook of multiple authorship. The latter, whatever its merits, has not the unity of view and the sense of proportion which belong to the former—qualities very important in a book intended for students.

It is for this reason that Prof. Luciani's book deserves a place beside the monumental cooperative physiologies which have been chiefly 'made in Germany.' Three volumes of not quite 300 pages each make of it a book comfortably handled and held. One interesting feature, to which Prof. Langley calls attention in the Preface, is the ascription of the discovery of the circulation of the blood to the Italian Cesalpinus instead of to Harvey, an extreme instance of the desire, noticeable throughout the book, to give Italian physiologists at least their due—and perhaps a little more.

**THE TONSILS.** Faucial, Lingual, and Pharyngeal. With Some Account of the Posterior and Lateral Pharyngeal Nodules. By Harry A. Barnes, M. D., Instructor in Laryngology, Harvard Medical School, etc. etc. Illustrated. St. Louis: C. V. Mosby Company. 1914. Price, \$3.00.

With the craze in tonsil surgery apparently at its height; with practically every medical journal in the country containing, in practically every issue, an exposé of *my* method of tonsil enucleation; and, with every cross-roads general practitioner trying from one to all of the various methods, of which he has read, upon the helpless and unsuspecting children of his community, the appearance of Dr. Barnes' book on "The Tonsils," is certainly refreshing. The title is, in a way, misleading, for, in addition to the tonsil, the work discusses the entire lymphoid ring which surrounds the beginning of the alimentary and respiratory tract.

The anatomy, histology, and pathology of the various portions are described and discussed in detail. Above all, they are illustrated by excellent drawings and most excellent microphotographs. A special chapter is devoted to the various theories advanced as to the function of the tonsil. In the chapters on tonsils and adenoids, special stress is laid upon the indications for operations. It seems too bad that these indications could not be more generally read. We feel certain that the ordinary conception of indications is much more comprehensive.

While the operation preferred by the author is given in more intimate detail, other operations are fully described and the reader is left to choose. Altogether, this is a most readable and timely book. The whole field of the tonsil question is thoroughly covered from a safe and sane, scientific point of view. It will be read too little by those who need it most. The others, too, will benefit from its perusal.

**FRACTURES AND DISLOCATIONS.** Diagnosis and Treatment. By Miller E. Preston, A. B., M. D., First Lieut. M. R. C., U. S. A.; Surgical Examiner, Colorado State Board of Medical Examiners, etc. etc. With a Chapter on Roentgenology. By H. G. Stover, M. D., Professor of Roentgenology, School of Medicine, University of Colorado, etc. etc. 860 Illustrations. St. Louis: C. V. Mosby Company. 1915. Price, \$6.50.

This is an excellent and a very full treatise. It follows, pretty closely, the lines laid down in Scudder's volume on fractures, and is equally as satisfactory in general as is this eminently excellent book. The chapter devoted to *x*-rays, written by Stover, deserves special mention for the practical and clear exposition detailing the close interdependence of *x*-ray technique and the proper treatment of fractures.

Surgeons in the West will note with some disappointment the marked inadequacy of the description of the Hodgen splint. It is a real pity that this appliance has never gained wider acceptance. One who is skilled in the application of the Hodgen splint is able to show a larger proportion of good results in treatment of femoral fracture than can be attained with the use of any other single method.

The pages devoted to fractures of the carpal bones are also not as full as they might be. This deficiency is magnified by the recent very full exposition of these fractures, furnished by Murphy, of Chicago.

As a whole, however, the book shows that great care has been exercised in the manner of preparation, and in the presentation of the various types of fracture. The illustrations are excellent and serve, in the most lucid fashion, to clarify the text, though this is hardly necessary, being in itself very understandable, indeed.

**CASSELL'S CYCLOPEDIA OF PHOTOGRAPHY.** Edited by Bernard E. Jones, Editor of "Work." Illustrated by Twenty-Four Full-Page Plates in Colour and Half-Tone, and by Hundreds of Line Drawings in the Text.. New York: Funk and Wagnalls Company. 1915. Price, \$3.75.

The roentgenologist is usually interested in photographic work. If this interest is not natural it is frequently forced upon him. The dependence of good roentgen negatives upon dark-room technique forces the roentgenologist in the intricacies of photographic chemistry and allied subjects. Because the roentgenologist maintains a dark-room and a camera outfit for reductions and lantern slides, he is often induced to assist his colleagues in all photomicrography, medical illustrations, photography, etc.

Therefore Cassell's "Cyclopedia of Photography" will be necessary equipment for the roentgen laboratory. It gives technical information upon lenses, color photography, photographic chemistry. It gives detailed answers for the innumerable questions which arise in photography.

The roentgen portion of the book is by J. I. Pigg, of England. It is quite brief. But the value of this book to the roentgenologist does not depend upon this so much as the great amount of information upon the other branches of photography which it contains.

The contributors are mostly members of the Royal Photographic Society of England. They have included every accepted photographic term and surveyed the whole field of photographic knowledge.

It is remarkable how interesting such an addition to one's library will be. Obscure terms, formulæ, apparatus, lenses, speed of plates, historical facts, in fact, everything connected in the least with photographic science is thoroughly discussed in detail.

**LEAD POISONING.** From the Industrial, Medical, and Social Points of View. Lectures Delivered at The Royal Institute of Public Health. By Sir Thomas Oliver, M. A., M. D., M. R. C. P., Consulting Physician, Royal Victoria Infirmary, etc. etc. New York: Paul B. Hoeber. 1915. Price, \$2.00.

These lectures were delivered at the Royal Institute of Public Health in Russell Square, and had to do with the consideration of lead poisoning from the industrial, medical and social point of view. This small treatise is written by an expert on the subject, as Sir Thomas Oliver has been medical expert for the Dangerous Trades Committee.

In the introductory chapters is a brief and clear description of the processes of manufacture in which white lead is used, and all industries in which lead in any form is used in manufacturing processes from which toxic results may be expected. The clinical side of the subject is treated in a clear and concise way without too much insistence on the purely technical or clinical point of view. There is an interesting sketch on water contamination by lead and a consideration of the definition of lead poisoning from the standpoint of the Workmen's Compensation Act. The appendix is taken up with a reprint of precautions taken in factory and workshops in order to prevent lead poisoning.

There is no book on this subject known to the reviewer in which so full and accurate an account of the industries and clinical side of lead poisoning can be found. It is written in the concise and accurate style which is so characteristic of the better English publications.

The book is unhesitatingly to be recommended to every one who wishes to understand something of the problem presented by industrial diseases, and particularly something of that most common of industrial diseases—lead poisoning.

**MENTAL MEDICINE AND NURSING.** For Use in Training-Schools for Nurses and in Medical Classes and a Ready Reference for the General Practitioner. By Robert Howland Chase, A. M., M. D., Physician-in-Chief, Friends Asylum for the Insane, etc. etc. 78 Illustrations. Philadelphia and London: J. B. Lippincott Company. 1914. Price, \$1.50.

According to the author's foreword, this book is to be accepted as an introduction to the study of mental diseases. It is especially designed for the use of training schools for nurses, and in medical classes, and as a ready reference for the general practitioner. With the limitation thus put upon the book by the author, nothing more than a general outline of psychiatry should be anticipated, and if it is found that within the necessarily limited extent a fair notion of the present problems of psychiatry can be found, the book must be regarded as of use.

There are a number of illustrations in the book taken from well-known text-



books, which are supposed to give momentary glimpses of facial expressions and attitudes in various types of psychosis. The utility of illustrations of this kind can be questioned in a treatise so limited in scope and so modest as this is.

This may be described as a safe book to put in the hands of nurses and perhaps in the hands of medical students. That either will be stimulated to go into the subject deeper by Chase's book is questionable.

Evidently there is need of a small sketch of psychiatry for the class of individuals for whom this is written and it is questionable whether it is possible to do more than Chase has done in the present volume. It is therefore to be recommended to those for whom it was designed in the first instance.

LEHRBUCH DER ALLGEMEINEN PATHOLOGIE UND DER PATHOLOGISCHEN ANATOMIE. Von Prof. Dr. Hugo Ribbert, Ordentlichem Professor Der Allgemeinen Pathologie und der Pathologischen Anatomie und Direktor des Pathologischen Institutes der Universitaet Bonn, Geh. Med.-Rat. Mit 864 Figuren. 5 Auflage. Leipzig: Verlag von F. C. W. Vogel. 1915. Price, 16 m.

In these days of great specialization, when a book appears on so large a subject as "General and Special Pathology" written by one man, we cannot but expect some omissions, and at best a cursory review of many fields. Therefore, spoiled as we are by the production of collections of monographs which to-day serve us as textbooks, we must take up a book such as Ribbert's "Pathology," with certain preconceived critical ideas. And yet our feeling, when we have finished the book, is that here is a work which covers the field thoroughly, the development of which is logical and clear, and which omits none of the essentials.

If it be fair to criticise a book which makes for an effort at compactness on the basis of lack of fullness, it can be said that the book is somewhat lacking in its pathological physiology, and in its correlation of the clinical side with the morbid anatomy.

There are evidences of the recent revision, and in all fields the newest discoveries and suggestions have been incorporated in the text.

In certain places, and especially in the theoretical consideration of the origin of tumors, we note a one-sidedness of opinion, a thrusting forward of the personal opinions of the author, and a failure to consider the opinions of others.

THE CLINICS OF JOHN B. MURPHY, M. D., at Mercy Hospital, Chicago, Ill. June, 1915. Volume IV, Number 111. Octavo of 196 pages, 90 illustrations. Published Bi-Monthly. Philadelphia: W. B. Saunders Company. 1915. Price, per year, \$8.00.

Beyond cavil or doubt the Murphy "Clinics" are now appearing in better form, and contain more substantial material than they have contained at any time during the past year. The illustrations are admirable, almost beyond compare. This particular number presents a fifty-page discussion of injuries to the carpus that is classical in its clearness and completeness. In addition to this leading article, there are clinical talks on intestinal obstruction, ulcer of the stomach, appendicitis, laminectomy with pedicled flap, tumor of the testicle, tuberculosis of the spermatic cord, chronic tendovaginitis, exostosis of the os calcis, perineal fecal fistula, hypernephroma, sarcoma of the malar bone, and epulis of the mandible.

As may be seen at a glance, the list of clinics contains several topics not heretofore discussed in the "Clinics," and what is of more importance, there is a freshness of tone to each discussion that must inspire all readers with enthusiasm.

A LABORATORY MANUAL AND TEXT-BOOK OF EMBRYOLOGY. By Charles William Prentiss, A. M., Ph. D., Professor of Microscopic Anatomy in the Northwestern University Medical School, Chicago. With 368 Illustrations, Many of Them in Colors. Philadelphia: W. B. Saunders Company. 1915. Price, \$3.75.

Following a suggestion first made by Minot, this new work combines brief descriptions of the vertebrate embryos, which are commonly studied in the laboratory, with an account of human embryology. Thus a volume is presented by the author, rather essentially different from the usual textbook of embryology.

Through continued reference to the better known facts concerning the development of the embryo of the pig and chick, greatly aided by excellent illustrations, Prentiss draws for the reader an unusually clear and comprehensive



picture of the development of the human embryo. The medical student will find in this new work a most valuable guide for practical laboratory work in embryology.

THE CLINICAL ANATOMY OF THE GASTRO-INTESTINAL TRACT. By T. Wingate Todd, M. B., Ch. B., F. R. C. S. (Eng.), Henry Willson Payne, Professor of Anatomy in the Western Reserve University, Cleveland, Ohio, etc. etc. New York: Longmans, Green and Company. 1915. Price, \$1.75.

This is a most useful work for the graduate student of medicine, and particularly for those who have a special interest, either medical or surgical, in the gastro-intestinal tract. The subject is treated from the clinical rather than from the anatomical side, and the book is replete with valuable facts and suggestions. Much attention is given to what might properly be called the radiographic anatomy of the stomach and intestines. Nor does the author avoid a discussion of those pathological anatomies which rest on an anatomic basis or influence anatomical relations. The interrelation of anatomy and physiology is kept constantly in mind. There is an extended bibliography to which reference is made throughout the text. The book is written in a style which holds the interest of the reader to a most unusual degree.

THE MODEL T FORD CAR. Its Construction, Operation and Repair. A Complete Practical Treatise Explaining the Operating Principles of All Parts of the Ford Automobile, with Complete Instructions for Driving and Maintenance. Includes the Most Thorough and Easily Understood Illustrated Instructions on Ford Repairing Ever Published. By Victor W. Pagé, M. E., Member Society of Automobile Engineers, etc. etc. Illustrated by over 100 Specially Made Diagrams and Distinctive Original Photographs of Actual Parts, all in Correct Proportion. New York: The Norman W. Henley Publishing Co. 1915. Price, \$1.00.

Very appropriately this little volume may be described as a textbook of the anatomy, physiology, pathology and treatment of Ford cars. It is written authoritatively by an engineer, owner and driver of such a car. We, therefore, feel justified in concluding this review with the customary sentence: Its perusal will prove instructive and valuable to the busy practitioner, especially as regards 'treatment.'

A MANUAL OF DISEASES OF THE NOSE, THROAT, AND EAR. By E. B. Gleason, M. D., LL. D., Professor of Otology in the Medico-Chirurgical College, etc. etc. Illustrated. Third Edition, Thoroughly Revised. Philadelphia: W. B. Saunders Company. 1914. Price, \$2.50.

The third edition of Gleason's "Manual" is a distinct improvement and advance over the two previous editions. It is not the purpose of the manual to give exhaustive descriptions and discussions, but rather a *multum in parvo*. This purpose the present volume, in the main, well satisfies. The style is, for the most part, clear and the illustrations well chosen and illuminating. Many of the latter are from original specimens and drawings.

Our principal criticism would be of the sections dealing with the more recent advances in diagnosis and treatment of the diseases of the inner ear. No doubt the subject matter is quite plain to the author, but we are not quite sure that he always expresses his thought in such a way that it would be equally clear to the beginner, for whom such a manual is intended.

A TEXT-BOOK OF SURGERY. For Students and Practitioners. By George Emerson Brewer, A. M., M. D., Professor of Surgery at the College of Physicians and Surgeons, Columbia University, New York, etc. etc. Assisted by Adrian V. S. Lambert, M. D., Associate Professor of Surgery, College of Physicians and Surgeons, Columbia University, etc. etc. And by Members of the Surgical Teaching Staff of Columbia University. Third and Enlarged Edition, Thoroughly Revised and Rewritten. Illustrated with 500 Engravings in the Text and 23 Plates in Colors and Monochrome. Philadelphia: Lea and Febiger. 1915.

In the hands of Brewer as teacher, this particular textbook undoubtedly serves the best possible purpose. When a writer has the ability possessed by Brewer, it is not difficult to understand the exceeding merit of his book, or the need for a third edition. The revision has been done in a painstaking manner.

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## EDITORIAL.

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### GREAT MEN: A SOLUTION OF THE PROBLEM.

If there is one criticism of the day that drives us almost into a Berserker rage it is to be thought by our fellowmen as not of that exalted type which by right of mental equipment and physical efficiency entitles one to be above the ordinary. In a contemptuous way we speak of middle-class minds, middle-class manners, middle-class incomes, middle-class houses and middle-class clothes. We cannot conceive of any good results accruing the world from middle-class aspirations, nor can we conceive why, though our early education may have been defective, it should not be possible for us to overcome all obstacles and shine forth as rare examples for emulation on the part of our fellowmen. Verily, the idea of the Superman has come to stay; and though we may deride the 'blond beast' of the Nietzschean philosophy, we must be somewhat in its thrall, otherwise the medical world and also the literary world would not hear constantly that we must improve mentally and physically if nations would continue to exist. Medical men have heretofore been busy combating disease by lessening the evils of wrong conceptions, wrong diagnoses, and wrong treatments. This undertaking, one would think, was gigantic enough to enlist their attention for many decades to come; but so great has the lure been which medical philosophers and reformers have held out, that many a good and honest practitioner of middle-class attainments and middle-class ploddings has been caught and held fast, and now talks about all practitioners having an aristocratic mental mold and physical proportions of the athletic sort or writing failure across the lintels of their doors, and even going to the length of warning his patients of the dire results from lapses from a high standard of morality, physical fitness, and mental development. This onward rush toward perfection has its good points, to be sure; but in our enthusiasms we must not overlook its weaknesses, and the greatest of these is our breathless haste to become Supermen. We forget

the wall Nature erects of a masonry that withstands shrapnel and bombs, and how stubborn she is in resisting attacks that mean her complete overthrow. She may smile, and no doubt has smiled, when we medical men show her how badly she has managed matters in the Jukes family without our intervention; but is not her smile Brobdingnagian laughter when she hears almost daily of the twaddle about the Superman?

As we have remarked before in these columns, medical men as reformers are not examples that one would cite with a great degree of enthusiasm, their common sense derived and nurtured by their contact with common clay being an excellent ballast to shorten their soarings into ideal atmospheres. They may be eugenists to a certain degree; they may be gloomily involved in the problem of sex and sex instruction for a time, and then extricate themselves from its many complications and be happy again; and they may have thoughts about the Superman, and in their earliest frenzies imagine that they are the ones to effect the change. Fortunately the daily grind involved in the general practitioner's busy and exacting life, or in the specialist's, be he housed in an office or in a laboratory, is of such magnitude that his plunges into reform are never very deep. And this is fortunate in every instance, for his real vocation is within the domain of common sense. This thought was brought home to us after reading Mr. Casper L. Redfield's pamphlet, "Great Men and How They Are Produced" (Chicago, 1915), since here we have a non-medical theorist who has gone deep into the subject, so deep, indeed, and with such assurance and self-satisfaction that no medical man, trammelled as he always is with common sense, could compete with him in the brassy trumpetings that are supposed to prelude a complete change in the human race.

What more simple than to have more great men, we seem to hear Mr. Redfield say as he looks up from the pages of his pamphlet at the incredulous expression on the face of his readers. Do not have children too rapidly, and do not marry too early in life. In case you want to marry, say at the age of twenty or twenty-one, turn your mind to some other subject; in fact, crush the thought until you are thirty or thirty-five. Having married, your children must be borne at long intervals, because "rapid breeding inevitably and necessarily leads to the production of inferior stock, no matter what the original stock may be." In short, you are just like other animals, no better no worse; a complimentary comparison, to say the least, and one that must be remembered if your desire is the production of great men. To continue: "Slow breeding is an essential to the production of superior stock, and, when properly used, inferior stock can be transformed into superior stock in about 100 years, and into eminent men in less than 200 years."

The fascinations of this theory are so many and varied that the reader must at once be caught in their meshes. Why should



he continue his stubborn ways and marry young and think his goal as a good citizen is reached only when he is the father of six or eight children? Why has he not trimmed down the number of children before now, and seen to it that the two or three were born at intervals, say, of ten years? Think of the stupidity of Germany all along; Germany that daily declares to the world in a most annoying manner that she alone of all the nations has solved every problem under the sun! We know that early marriages are encouraged in Germany, that large families and necessarily rapid breeding are countenanced by word of government, and word of poet and playwright, and that in no country has the birth-rate been less reduced. And are we to hear that Germany has produced no great men, no outstanding figures in art, literature, and the sciences?

A very upsetting and disturbing pamphlet is Mr. Redfield's, for it teaches lessons we felt were right some years ago and know to-day to be wrong, because our happiness has been made complete by marrying young and having large families. At least, this is what we read when a medical man writes on the subject, but surely he must be mistaken: another instance illustrating the result of not plunging deep enough into a subject, as we observed above. Of course, the medical man in advocating early marriage and large families thought only of the husband's escape from sexual diseases by 'rushing' him into matrimony and the wife's peace and content by having a large family. No thought was given to the production of great men. No thought was given to what we owe to society.

P. S.

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#### THE DEGENERACY OF THE FRENCH.

Mr. Chesterton has recently said: "I believe our false notion of the French character was very largely founded on the French cabman. And I believe that being to be a subtle if not sensitive spirit, who is much misunderstood. Not all English travellers, perhaps, fell into the merely verbal error of the old lady who observed a certain coldness in the *cocher* (cabman) whom she had ceremoniously addressed as *cochon* (hog) . . . . For instance, the three main impressions formed by the poor old woman about her *cochon* probably were: (1) that he drove wildly; (2) that he shouted, cracked his whip, and kicked up a general shindy; (3) that he was rude. The old woman reported this to the other old women who write authoritative books on foreign policy and imperial travel, and the result was a picture of the Frenchman as merely excitable and undisciplined; so that to speak of the French calm still seems like a paradox."

The foregoing quotation has seemed to us so meritorious that though we seriously thought of beginning this little essay on the degeneration of the French people in a more scientific manner, the

genius of the English essayist, as crystallized in the quoted lines, really made sport of what we had conceived as a scientific beginning. And even before we read what Mr. Chesterton had written on the subject, we were only lukewarm in regard to what science had proved against the normality of the Frenchman, for recent facts were crowding out of our mind the misconceptions and misunderstandings which writers of all shades had planted there, and which we had nurtured for years. Perhaps, we were like the rank and file in all communities; no better read and with only the smallest idea of the French language. Perhaps, we, too, had been ignorant of the fine distinction between *cocher* and *cochon* and had even insisted, in the presence of a Frenchman, that there really was no difference. And perhaps this Frenchman got very much excited, and talked wildly and gesticulated wildly and frothed at the mouth. What did we think of him? To be candid, we thought him unmanageable, unstable, and so lacking in calm that he was almost semi-insane. Were we less communicative than the old lady whom Mr. Chesterton mentions? On the contrary, we were more communicative, because not only did we tell our friends how grossly we had been insulted by a madman, but we thought it our duty to inform our medical confrères through the medical press just how long the French nation could exist, and how wobbly it really was, mentally speaking, in our opinion. To strengthen our attitude we read about Baudelaire and Guy de Maupassant and Gérard de Nerval and Alfred de Musset, and others, whom certain medical authors had pronounced semi-insane; and great was our opinion of our own erudition and of the certainty that the French nation could not last.

The editorial 'we' which we have just used can easily be expanded to include thousands upon thousands of intelligent people in this country, not overlooking a goodly quota of physicians. The latter have not been averse from expressing their scientific (?) opinions on degeneration in many medical journals, on grounds that were as superficial as the old lady's conclusions. Being as well read in French literature as we have been modest enough to confess, their last paragraph (at times it was their first) was invariably that the seeds of degeneration were shipped to us from French soil, and that if the weird and strange customs of that degenerate country could be kept out of our puritanic country, our insane asylums would be quite depleted. Of course, these great authorities (great in the sense that they could not differentiate between *cochon* and *cocher* with a greater degree of nicety than did Mr. Chesterton's old lady) saw to it that the daily press was made cognizant of their latest excursion into science; and again the layman had the exquisite pleasure of hearing all about his normal mentality and the abnormal mentality of the whole French nation. And great was his horror of what would happen if anything that smacked of France were introduced into his household;

and hating the thought that there might be an infection in his case if not continually on the lookout to ward off the French invasion of degenerative ideas, he, too, could not see why a Frenchman should be lashed into a fury because he called him a *cochon* instead of a *cocher*!

Out of the Great Misunderstanding that is going on in Europe to-day, many changes will result; political, literary, philosophical and social. But the most gratifying change to a long-suffering medical community, such as ours has been (especially that part that reads medical journals and books on psychology and the pathology of the mind), will be the obliteration of all mention of the degeneracy of the French nation. This must come if we follow closely the stability, the courage, the discipline of the whole nation under the trying conditions which are happening to-day. No nation that is degenerate could do what the French are daily doing, and no nation that is at war is behaving with less emotion, less excitement, less ostentation. Let us as medical men forget the innumerable essays we have read on the degeneracy of this people, and let us try to readjust our minds by cleaning their Augean stables of all the tares which our own imagination and the superficial thoughts of others have planted there. Baudelaire was addicted to opium and so was Edgar Allan Poe; but what American would call his own people degenerate because of this instance?

P. S.

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MR. SMITH, SURGEON.

The observer of the progress of medicine in this country should be heartened by the latest bit of news that has reached a number of our medical centres, and which, to be brief, is this: The American College of Surgeons has approved the desire of many surgeons to obtain a distinct degree which would differentiate them from practitioners of medicine. There is a strong feeling in the profession that much confusion would be avoided if to surgeons was given a distinctive title. Pressure will be brought to bear upon the medical schools of the country.

Here we have the promise of a subversion of all our cherished ideas, of all our democratic ideals. We know that surgeons are specialists and ought to be known as such, and that the general practitioner has no right to operate, no matter how insignificant the operation. We know that the man who wields the lancet is worthy of praise, and we also know that in his desire to be known as a surgeon he has the welfare of the people at heart. We know that the general practitioner is a poor operator at best, and that his surgical performances on some of his patients have been quite fantastic. But even though we know all this, and really feel that the times are ripe for a broad line of demarcation between the two, the idea of a distinctive title is repellent to our democratic ideals. True, in England, a surgeon is known as mister and not as doctor, but are we to imitate the English in this matter? And if we do not, what other distinctive title could be given the surgeon? Surely not the German word '*von*' or the French word '*de*,'



words which, though they might open certain portals in society to the bearers, would have no meaning in a surgical sense. But perhaps the College of Surgeons has a title up its sleeve that it will not divulge until 'the medical schools of the country' agree to the 'pressure.' Think of the medical schools of the country agreeing!

While we are still in a state of doubt as what the real title is going to be, may we offer a few suggestions to the College of Surgeons, which, if followed, will obviate any deep thinking as what the title ought to be and give no offence to the general practitioner. For some time past we have noted, with considerable depression, the monotony of the signs which proclaim the presence of a physician in a building. Without exception, they carry gilt lettering on a black background, or white lettering; and while the modesty of this form of advertisement cannot possibly collide with medical ethics, it must be admitted by all, who tire of monotony, that modesty in this instance has been a great leveller,—the great and glorious names being on the same lowly plane with the insignificant ones. In the ages that have crumbled into dust by now, surgery was in the hands of the barber-surgeons, and even then, though we are not in a position to say that the men were bitten with any aristocratic notions, they had a distinctive sign which to-day is still alive in front of barber shops. Now would it not be better for the whole medical profession, if instead of a title that would cause only jealousy and bitter feelings between the surgeon and the general practitioner, the former would change his monotonous sign to gilt lettering against a background of red and white? How easy to do this and how readily all passers-by would recognize that a surgeon is within. If this obtained, no longer would we hear of some poor wight or 'wightess' going to a general practitioner for a surgical 'trouble'; for it stands to reason that the flamboyant sign would carry at once to his or her limited intelligence the good news that a surgeon resides in the house. But would the less modest sign offend our ethics? Here's the rub.

The general practitioner is going out of fashion with a speed that makes the onlooker dizzy. There was a time when he was respected both by families and his confrères who happened to be specialists, but that time is gone the way of all old-fashioned notions and customs. He still wears good clothes and his back is still straight, but these distinctive signs of prosperous manhood will not be his for long. As general practitioner he was *persona grata* at all the houses where he had patients, and much was made over him. It is true that he did things he should not have done: prescribed drops for the eyes when they were slightly inflamed; gave a gargle for a sore throat; opened a felon or a boil. He was willing to do all this, and sometimes he was not, but the family insisted. Gradually the family did not insist, and though he was still *persona grata*, he realized that the specialist was making inroads into his practice. Of the three diseases we have cited, only the felon or the boil remained for his ministrations; and to-day, what with the placing of surgery on the highest plane in medicine (a position we approve of), these, too, will slip through his hands. But his sign, if what we have suggested shall obtain, will always be the more modest by comparison with the surgeon's; and that is something to be grateful for to one who has the privilege of enjoying only small gifts.

P. S.

## ORIGINAL ARTICLES.

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### DREAM AND NEUROSIS.\*

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Never in this world do we get everything we want. Reality always falls far short of being quite satisfactory. Even under the best circumstances we have a great many wishes that are unfulfilled and must indefinitely remain so. It is fortunate, then, that we do not have to depend wholly upon reality to satisfy our longings. Imagination comes to our aid and gives us what reality withholds. In our day dreams we see ourselves achieving the impossible, conquering the unconquerable, attaining the unattainable. The poor man is rich, the blind man sees, and the rejected lover basks in the smiles of his inamorata. In short, there is no wish so absurd, no longing so unreasonable that imagination is unable to fulfil it.

The tendency to satisfy with pictures of the imagination the desires that reality leaves ungratified—a tendency that plays an enormous rôle in the daily life even of the most prosaic—does not become inoperative as soon as we fall asleep. Cravings and wishes persist from the day and, if intense enough, serve to disturb our slumber. Then in our sleep, just as in our waking moments, we call imagination to our aid and attempt to still and satisfy these longings by means of fantasy, so that upon awaking we say that we have *dreamed*.

In short, the night dream and the day dream are wholly analogous. Either may be described as the imaginary fulfilment of a wish. The truth of this statement is not, however, self-evident. That the day dream is nothing but a fantasied wish-fulfilment is perfectly obvious. But that the night dream invariably fulfils a wish seems, at first thought, impossible. For instance, over fifty per cent. of dreams seem to the dreamer distinctly disagreeable, while many others, though not positively unpleasant, nevertheless apparently fail to represent anything for which a *sane* person might be supposed to wish.

Yet the apparent unlikeness between the night dream and the

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\*Read before the Society of the Alumni of Bellevue Hospital, May 5th, 1915.

day dream is due not to any lapse of the principle of wish-fulfilment, but mainly to a difference in the way the desired things are represented. In the day dream the representation is direct; the thing or occurrence that is desired is pictured as actual and present, without any ambiguity or vagueness. But in the night dream the representation is indirect. The desired things, instead of being pictured in their true form, are represented by implications, by symbols, by allegorical figures, and by associated ideas. Thus, though the day dream may be taken at its face value, the meaning of the night dream is not to be found on the surface. The night dream like a rebus or allegory has to be interpreted if we would know its meaning. Only in this way can we learn what wish it fulfils. The appearance of absurdity and senselessness which most of our night dreams possess is not due to any actual lack of meaning, but may be accounted for very largely by the single fact that indirect, rather than direct, representation is employed.\*

But in order to make perfectly clear the difference between direct and indirect representation, let me give an example of the latter. You see here a picture of a man, who, judging from the armor he wears, would seem to belong to the time of Julius Caesar. Nevertheless, he stands near a very modern lamp-post on a curb of what one would suppose to be Spring Street. He holds in one hand a watch of remarkable size and in the other a bouquet composed of flowers and bayonets. The picture, in short, gives the same impression of absurdity as do most of our dreams, and, like a dream, it would tempt one who saw it for the first time to say that it had neither sense nor meaning.

But though this picture may seem as absurd as our dreams, it comes not from a dream but from a newspaper. It is a cartoon with the title "This Is the Place, but Where's the Girl?" and it appeared in a recent issue of the *New York Times*. It expresses a thought in much the same way that thoughts are expressed in dreams—namely, by indirect representation. Hence the picture, like a dream, has to be interpreted before we can learn its meaning.

The artist was obliging enough to label his symbols. In the original of this picture the sheet of paper which lies upon the sidewalk in front of the man was inscribed with the words "Italy to go to war in the Spring," and the tag attached to the bouquet which the man carries bore the words "For Miss Italy." By the aid of these hints the picture is very readily interpreted. Evidently the thought it expresses is something like this: "Italy, like a fickle girl, has failed to join in the war at the time expected." But notice

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\*There are some minor exceptions to the rule that the representation in night dreams is indirect. In the dreams of young children, and in certain dreams of adults, especially those which fulfil by way of imagination some wish which arises during sleep—such as the desire for micturition, thirst, or sometimes, sexual desire—the things wished for are represented quite directly.



the indirect representation. The artist has used as symbols a man, a bouquet, and a lamp-post to express a thought about something entirely different—namely, the attitude of a country toward expectant militarism.

Now, this is exactly the method of representation that is used in dreams. There is this one difference, however. The symbols used in the dream are not labeled as the artist has labeled the sym-



bols in the picture. The dream is like the picture as I have displayed it—that is, without the printed words which appeared in the original. Hence, in interpreting a dream we ordinarily have to get the dreamer to label his symbols after the dream is finished. This labeling of dream symbols is accomplished by obtaining from the dreamer the ideas he associates with the different elements of the dream. That is, we ask him to fix his mind upon each part of the dream in turn and to relate, without exerting any critique,

all his incoming thoughts. The associations thus obtained correspond to the words which the artist printed in the original of the picture and give the key to the interpretation of the dream in the same way that the words give the interpretation of the picture. They reveal the hidden portion of the dream.

Let me now by giving part of two actual dreams exemplify the way dream thoughts are represented. A woman had received a visit from one of her old lovers who now lives in Massachusetts. A few nights later she had a dream in which she found herself standing in an open meadow. The grass all about her was of a very fresh brilliant green. Close by was a tiny stream of water which seemed to have its source at the base of a rocky ledge a short distance away.

Now this, remember, was indirect representation. We cannot interpret it without the dreamer's associations; we must get her to label her symbols. Her associations were as follows: The bright fresh color of the grass reminded her that she had seen just this color when as a girl she lived in the country and went out to gather cowslips early in the spring. The little stream of water coming from the ledge of rocks she recognized as a memory picture of an actual stream which arose from a spring in a meadow near where she lived in her childhood. This particular meadow was spoken of in her family as the 'spring lot.'

Her associations were, then, *a field in the spring*, and *a field with a spring in it*, which, furthermore, was known as the 'spring lot.' I may, therefore, state, without more ado, that the field in which she found herself in the dream represented the city of *Springfield* in Massachusetts. This is the town in which her former lover lives. The dream fulfils a wish to be there with him.

A second example of indirect representation is this. A man who was much annoyed with himself for having done something very foolish had a dream in the first part of which he found himself in the centre of an oval sheet of paper. That is, the sheet of paper had a hole in the middle and his body was thrust through this hole so that the paper stuck out horizontally from his waist on all sides. When he was asked for associations, the sheet of paper brought to his mind the fact that he always carries with him sheets of tissue paper with a hole in the centre which he uses to cover the closet seat when he has occasion to use a public toilet. A sheet of paper of this sort he is accustomed to refer to humorously as a 'peri-anus.' In the dream, then, he finds himself in the centre of a 'peri-anus.' But the thing one might expect to find in the centre of a 'peri-anus' is an anus itself. This fact the dream utilizes to make reference to the foolish act I have spoken of; that is, the dream, by representing the dreamer in the centre of a 'peri-anus,' expresses his annoyed conviction that he is an ass.

Now, I hope that these examples have made clear that, in a way, there are two parts to every dream—namely, the actual text of the dream—the collection of pictures which the dreamer remembers on awaking—and the hidden thought which these pictures represent, and which can be obtained only by analysis. Those of you who read the *Evening Mail* may realize that the way in which the thoughts are expressed in the two examples of dream symbolism I have given is very similar to that employed in the “*Book Lovers*” contest which appears in that newspaper. The *Mail* prints a series of pictures, each one of which is supposed to represent the title of some book, and the reader seeks to guess from the picture what particular book is represented. Now, the dream, as we remember it upon awaking, corresponds to the picture representing the title of a book. This part of the dream is known as its manifest content. The hidden part of the dream—the part which we obtain only by analysis—corresponds to the actual title of the book in the newspaper contest. This part is known as the latent dream-content. It is not the manifest but the latent content of the dream which in each dream corresponds to the thing or occurrence wished for. The manifest content simply *represents* what is wished for, in the same way that the pictures in the newspaper *represent* the title of some book, but *are not* the actual title.

This distinction between the manifest and the latent content of the dream has been repeatedly emphasized by all psychoanalytic writers, but their readers with almost unbelievable regularity have failed to comprehend and appreciate it. Again and again one hears the objection that the dream cannot represent a wish-fulfilment because all people have unpleasant dreams. Such an objection is possible only through misunderstanding. The manifest content is not what is wished for any more than the United States Ambassador to England *is* the United States. The manifest content, like an ambassador, merely *represents* something, and what fulfils the wish is not the representative but the thing represented. The fact, then, that the manifest content or representative may appear unpleasant does not imply that the thoughts represented must be unpleasant.

I will now give the analysis of a dream which on the surface is unpleasant, but which nevertheless represents the fulfilment of a wish. It will be well, however, to begin with some account of the history of the dreamer and the condition which brought her to me. The dreamer in question is a young woman of twenty who had been employed for two years as a stenographer in a downtown office. The nervous condition for which she sought treatment came on as follows. One day as she was walking along an empty street, a drunken man some distance behind her suddenly shouted, waved his arms, and ran after her. She was very much frightened and



tried to run, but she made little headway, for her legs seemed heavy and she experienced that same sense of paralysis that one sometimes feels in dreams. In a few moments, however, the man gave up pursuit and she escaped, apparently none the worse for the incident.

The next day, however, she suddenly had a fainting attack. This was soon repeated, and in a short time she had developed an intense fear of going out of the house alone, and of riding on the subway and street cars. Her idea was that she might at any time have another fainting attack and die in it. She realized, nevertheless, that she was in no actual danger and that on the whole her fear was absurd. But in spite of this she could not overcome it. Any attempt she made to go out of her house alone, or to ride in any public conveyance even if there was some one with her, ordinarily resulted in her developing a spasm of terror accompanied by a feeling of weakness and dizziness, in consequence of which she would have to return home at once. Naturally, the fear made it impossible for her to get to the office where she had been employed, so when I first saw her she had not worked for several months.

The patient's mother, with whom I had a private conversation at the beginning of the treatment, explained to me that the girl had been brought up with the utmost care and shielded in every possible way from all knowledge of evil, a statement which I can now confirm. She added, shrewdly, that the young woman seemed to be afraid of men, and that in her opinion this might have something to do with her nervousness. Incidentally, she mentioned, that a most superior young man, whom we may call Mr. X., had an office in the same building where the girl had been employed, had paid her a good deal of attention, evidently wanting to marry her, but the girl seemed to dislike him intensely and never appeared to be at ease in his presence. Soon after beginning the treatment, the girl herself made mention of Mr. X., but only in terms of aversion, dislike, and distrust.

Early in the treatment the patient had the following dream. She was struggling with a large, slim, grey dog, which had a very long nose, and the dog was trying to bite her. In spite of her efforts, it did finally bite her, somewhere in the thigh. She saw a little blood flow from the wound, and shortly afterward perceived that her body was swelling up to an enormous size. At this point she awoke in great fear.

This dream, if judged by its manifest content alone, certainly does not appear to be a wish-fulfilment. The young lady, in fact, is afraid of strange dogs, and thus the dream seems more likely to be the fulfilment of a fear. But let me repeat once more that the night dream cannot be taken at its face value. We are dealing with indirect representation. The things or occurrences pictured

in the dream are not in themselves what is wished for, but merely *represent* something else, possibly quite different, and it is this something else that is desired.

Now, as a matter of fact, although this dream was an unpleasant one on the surface, yet it is so typical of its kind that anyone who has had a little experience in analyzing dreams would not only instantly recognize it as a thinly disguised wish-fulfilment, but would also know in a general way the sort of wish fulfilled. In short, it is evidently a sexual dream. Its symbolism is very typical. Young girls are very apt to conceive of sexuality as something violent. When, then, a girl dreams of some violent experience or attack we can be pretty sure that what she has in mind is some wished-for sexual experience. And when, as in this case, the violent experience as pictured in the dream results in the shedding of a little blood, and is followed by swelling of the body, the analogy to defloration and a resulting pregnancy is so striking that one need have little doubt as to what the dream means.

But I wish to state at once that, though all this came to my mind as soon as the girl told me her dream, I gave her not the slightest hint of my suspicions, but in the regular way asked for associations to the dream, without in the least intimating that I had any idea of what it meant. Let me now record her associations and see how well they supported the foregoing conclusions as to the meaning of the dream.

At first the girl said the dream brought nothing to her mind. Then after much hesitation she confessed that she had thought of something which she was ashamed to tell me because it had to do with sex. Finally, however, I got the following story. It seems that shortly before her illness began she had read in the papers some reports of white slave investigation, and since, as I have said, she had been brought up most carefully, she had only a vague idea of what all this meant. But her curiosity was aroused and after some hesitation she finally went to a girl friend and asked for enlightenment. Her friend was only too glad to tell what she knew, and, among other pieces of information, gave a description more vivid than accurate of the sensations a virgin might be expected to experience upon first performing the sexual act. From this description, which I need not repeat, the girl derived the impression that coitus is a very painful and bloody affair, and that men when swayed by sexual emotion are only a little removed from wild beasts. In spite of this impression, the theme of sexual relations had a certain fascination for the girl, and the picture her friend had drawn, although hardly an inviting one, kept recurring to her mind in spite of the fact that she made no little effort to banish it.

But now to return to the dream. Since the matters I have just

related came to the girl's mind as an association to the attack made upon her by the dog, and show clearly that she conceived of the sexual relation as something animal-like and violent, we may conclude that I was right in supposing that this attack represented a fantasy of a sexual experience. In designating the young lady's *thigh* as the point attacked, the dream employed the same symbolism that is familiar to us from the Bible, wherein the word 'thigh' is often used when another part of the body is meant.

But now what, or rather whom, does the dog represent? When asked for associations concerning the dog in the dream, the girl recalled that on the night the dream occurred she had been showing to some friends a number of snapshots taken the preceding summer. One of these was a picture of herself with her arms around a large dog. The dog in the picture, however, did not look much like the one she saw in her dream. After telling me this the girl stopped and said that she could give no further associations. I insisted that there must be something more in her mind, and at last she began to laugh and replied: "You are right; I did think of something. One of the young men, when he saw the picture of me with my arms around the dog, said something that amused me very much. He said that *he wished he were that dog.*"

It would seem, then, that this dream was a wish-fulfilment in even more than the usual sense. The dog in the dream did not look much like the dog in the picture, but was slim, grey, and had a long nose. But the young man who said he would like to be the dog has a long nose, is slim, and on the evening in question wore a grey suit of the same color as the dog in the dream. In short, he is the dog in the dream. The dream represents the young man's wish as fulfilled.

But the dream shows that the young man's wishes and feelings toward the girl were by no means unreciprocated. Evidently, she wished he would get his wish, and even more. In short, the dream is clearly a fantasy of coitus and a resulting pregnancy, with the young man playing the active rôle. It fulfils a wish of a most definitely erotic nature. But the surprising thing about it is that the young man who made the remark that has been quoted, and who is represented by the dog, was none other than that same Mr. X. toward whom the patient asserted she had no other feelings than those of repugnance and dislike. Thus, the analysis of the dream forms a direct contradiction to her previous assertions as to her state of mind concerning him.

This brings us to a very important matter—the relationship between the dream, the patient's conscious thoughts, and the neurosis. This girl, as I have said, had been brought up most carefully, and with the idea of shielding her from all knowledge of evil. The only references to matters of sex that were ever made in her home



were such as to imply that the theme was one for which a proper young lady could feel nothing but repugnance, and that such things were not to be known or to be thought about. In short, the girl had been taught to believe that everything connected with sex was identical, on the one hand, with sin, and, on the other, with filth. It need hardly be said, then, that in her mental life all tendencies toward the erotic had been subjected to a firm and strict repression.

But at the time of the outbreak of the neurosis this repression had begun to fail. Several incidents, in addition to that connected with the white slave reports, had forced upon the girl a consciousness of sexuality within herself. I need mention only one of these incidents. Once when she was coming up on the subway with Mr. X. the car was crowded, and so he put his hand upon her arm to steady her. Then, to her absolute astonishment, she felt toward him in response to his touch a sudden wave of intense sexual desire.

Now, it is not difficult to understand what effect this incident must have had upon the girl. For her to discover herself capable of such emotions filled her with horror and despair. Such feelings meant to her a sign of absolute depravity. And now begins to appear the meaning of her neurosis. We see from the analysis of her dream, as well as from the incident of the subway, that Mr. X. must have appealed strongly to her instincts, and inspired in her longings of a most plainly erotic character. But these feelings were of the very sort which, as far as her conscious personality was concerned, she was most unwilling to entertain. They were strong enough, however, for her to feel that she could not trust herself. She was afraid of what might happen if she kept on working at the office, where she saw Mr. X. every day. As was quite natural, however, she was unwilling to admit to herself her own weakness, and so, instead of attaching her fear to the things which actually caused it, she displaced it to something else—namely, to the idea of going out alone and of riding in public conveyances. Her fear, then, like all other fears, was a protective mechanism, for, in the first place, it made it impossible for her to leave the house unless there was some safe person with her; while, in the second, it prevented her from riding in public conveyances, which, of course, were the only means she had of reaching that danger zone, the office.\* It kept her out of danger, for after her neurosis developed she saw Mr. X. only on those rare occasions when in spite of her efforts to discourage him he called at her house.

The dislike which she professed to feel for Mr. X. had the same significance as her fear. It was an artificial emotion which she had manufactured in an attempt to counteract what she regarded

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\*This, of course, was not the only determinant of her fear. Another one will be mentioned later, but there were still others which cannot be discussed here.

as a tendency to like him too much and in a way that to her meant depravity.

The basis for the young lady's fear, then, was not an outer danger, but an inner one. Like all neurotic fear, it was a fear of desire, a dread of some part of herself. The incident of her being pursued by the drunken man gives a graphic illustration of the conflict going on within her. Her alcoholic pursuer to her symbolized masculine sexual aggression. The sense of paralysis which made her unable to run represented her unconscious wish to be caught, not by that particular man, of course, but by what he represented to her—the male sex.

Now, the idea which I have just stated, that neurotic fear has its source in desire, is not altogether a new one, although Freud was the first to attribute to it any psychological or medical importance. To illustrate that a perception of this relationship between fear and desire is, in a way, common property, perhaps the following story will not be out of place. The traditional Miss Antique came to the boarding house table one night in a state of great excitement. "Oh!" she cried, "I've had *such* an experience! Just now as I was coming home through a dark and lonely street I saw a man! And, my goodness, how I did run!"

"You don't say so?" returned one of the boarders, looking up with an expression of sympathetic interest. "And did you catch him, Miss Antique?"

Now, to illustrate the point I am trying to make, this story does not have to be true. Whether the story is true or not, women of the sort it describes do unquestionably exist. And their exaggerated fear of men is, as the cynical boarder interpreted it, just as certainly an overcompensation for unsatisfied desire. Furthermore, there are many people who, like the boarder and quite independently of Freud, have recognized the existence of this close relation between desire and fear. The point of interest to us is that the fear felt by Miss Antique in the story and the young girl's fear of going out alone and of public conveyances have the same psychological structure. The difference between them is only one of degree. Both represent a sort of overcompensation for an instinctive wish. Both consist in an exaggerated tendency to go in the opposite direction to that prompted by instinct. And if we understand the real meaning of the old maid's fear in the story, we shall understand the mechanism of all neurotic fear.

But to return to the point I wish to bring out—the relationship between the conscious personality of the patient and the dream, and the neurosis. As far as her conscious personality was concerned, the patient was a girl possessed of the strictest sense of morality and an intense abhorrence of anything sensual and erotic; but her conscious personality did not comprise the whole of her-

self. Behind it was hidden a second self—a complex made up of precisely those sexual longings and interests which her conscious self detested. For a long time she had successfully repressed this self, but now it was becoming too strong for her. Her repression was beginning to fail, and the onset of the neurosis coincided with this failure of a previously relatively perfect repression of this instinctive self. The neurosis, by withdrawing her from those situations which brought her sexual self into the foreground, represented a last desperate effort to maintain the repression.

Now, the whole situation is summed up in her dream. Her struggle against the dog corresponds to her struggle to maintain the repression of her erotic instincts. Her lack of success in the struggle with the dog corresponds to her failure to overcome the attraction the young man had upon her. The dog's biting her and the result of this bite were an imaginary fulfilment of those wishes which swayed the nonconscious part of herself and formed the motive power of her neurosis. In short, the dream gives, so to speak, a cross section of her mental life as a whole and of her neurosis in particular.

I call attention to this because it is not exceptional but typical. What is true of this dream is in general true of any dream; that is to say, the wish which the dream fulfils arises in a submerged and unperceived part of the self, a part composed of those primitive feelings of any nature which are offensive to the conscious personality of the individual and which are in consequence excluded from his consciousness. And these same wishes which find fulfilment in our dreams are the ones which in predisposed individuals furnish the driving force of the neurosis.

Now, the point just brought out—namely, that the wish fulfilled in the dream belongs to an objected-to part of the personality, furnishes the answer to a question that has doubtless arisen in the minds of many of you. Why does the night dream so consistently employ a mode of representation that is not direct, but indirect? Why does not the night dream depict as does the day dream the thing or occurrence wished for, frankly and in its true form? The reason is this. The wishes which the night dream fulfils are in general of a sort to which the dreamer objects, and which he does not wish to know he has. They belong to the submerged tenth of his personality; the aristocracy of his consciousness would be offended by any fantasy openly representing their fulfilment. Hence, these wishes can express themselves only in a roundabout manner. Indirect representation is really a means of disguise, for it is only when disguised that these wishes are permitted to find fulfilment in the individual's consciousness. The disguise which the dream thoughts assume thus serves the purpose



of protecting the dreamer from realizing what he is really dreaming about.

I will now give another dream, which, although not unpleasant as was the preceding one, seems to deal with matters so unimportant that one would be tempted to doubt that it had any particular significance. The dreamer is a young Jewess whom I am treating for a compulsion neurosis. I should say as an introduction to the dream that about a year ago a young man, a Protestant, fell violently in love with her and besought her to marry him. She liked this man very much, and, as she explained, had it not been for the difference in race she could easily have reciprocated his feeling. But, not only did she regard the question of race and religion as important in itself, but even more so as applied to the matter of children. Marriages between Jews and Gentiles turned out well enough, according to her observation, so long as there were no children, but as soon as children came and the question arose as to whether they should be brought up as Jews or as Christians the situation at once became complicated, and, it seemed to her, trouble and unhappiness invariably resulted. In view of this, she had schooled herself, she stated, not to care for her Christian admirer.

The dream which I wish to relate occurred one night after the girl had had a violent quarrel with her mother, as a result of which when she retired for the night she reproached herself for all the trouble she was continually causing and decided that it would be better for both herself and her family if she did not live at home. She fell asleep thinking of ways and means to get away from home and to support herself without calling upon her family for assistance. Once asleep, she dreamed that there was at her house some person to whom she felt indebted for many attentions. Wishing to reciprocate in some way, she offered her hair comb to this person to use, and the offer was accepted. This was all of her dream.

In view of what I have just related, the interpretation of the dream is very easy. Without going into details, I may say that the person in the dream to whom she felt indebted for many attentions represented her Gentile lover, for whom, as I have said, she had schooled herself not to care because of the question of children. The offer of her comb in the dream refers to this question, for in telling what she associated with the comb she mentioned that when one person is about to use another's comb or brush the remark is sometimes made, "Don't do that; you will mix the breed." In the dream the offer of her comb for another's use represents an *intention to mix the breed* in the sense of marrying a Gentile and having children by him. The dream thus expresses as fulfilled her wish to accept her Christian lover and corresponds to a

reflection that, in view of the trouble she has at home, a marriage with him in spite of the disadvantages of mixing the breed might be better than remaining with her family.

I will close by giving the analysis of another dream from the same patient who had the dream about the dog. She had been under my care for some time and had improved very considerably. Still, her fear of public conveyances had not entirely vanished, and at the particular time this dream occurred it seemed as if matters were at a standstill, for she was making no further improvement. The dream shows the reason for this, and at the same time discloses an important piece of new information about the factors which operated to produce her neurosis.

This is her dream. "I was riding on a train or subway car. A fat man who sat near me dropped something and ordered me to pick it up for him. I resented being asked to wait on him and, seeing a key on the floor, I picked that up, with the thought that instead of doing what he wanted I was doing just the opposite. Then I ran and, getting off the train, hid in a house to get away from him. After a time the scene changed, and it seemed that I had started out to enlist in the German Army. Finally I found myself in an office, where sat a man who seemed to be a priest but who was also King James II. The man said, 'Tell me about the key,' and I started to do so. He listened with great interest, but he kept having to answer the telephone, and other interruptions occurred, so that the dream ended with my story unfinished."

This dream is too long to be interpreted here in all its details. I shall tell only the most important of the patient's associations to each element of the dream and explain them without taking up all the reasons upon which the explanation is based.

The first thought in the dream, "I was riding on a train," led the patient to remark, "Well, that is just what I cannot do now." We may, therefore, regard the fantasy "I was riding on a train" as the equivalent of the thought "Before I was taken sick"—thus, a sort of subordinate time-clause which introduces the main part of the dream.

The fat man in the dream proved to be the patient's employer, who, in fact, is very stout. His dropping something and asking her to pick it up and her resentment at this request have the following explanation. Her employer is a wealthy man, who for many years has been an intimate friend of her family. Though not really a relative, he has behaved as one and has been a second father to the patient since her early childhood. His kindness and generosity to her were almost without limit. It was to gratify a whim of his more than because there was any actual need of her working that the girl studied stenography and took a position in his office.

But soon after she began to work for him she had reasons to

be not altogether satisfied with the step she had taken. For, though outside office hours her employer maintained his usual attitude of thoughtfulness and consideration, yet in the office he treated her like any ordinary stenographer, ordered her around, scolded her for mistakes, swore in her presence, and heaped an enormous quantity of work upon her. This made her both unhappy and resentful, and, had it not been for the fear of hurting his feelings and the danger of the considerable material loss that might result if she incurred his displeasure, she would gladly have given up her position. In fact, if anything presented itself that would have furnished a good excuse for her leaving his employ, she would have been happy to take advantage of it. The inconsiderate attitude of her employer during business hours and her consequent resentment are represented in the dream by her resentment at being asked by the fat man to pick up something he had dropped. (Courtesy proscribes that gentlemen should pick up things for ladies. The order of the fat man in the dream was, then, just the reverse of what politeness requires.)

But in the dream she picked up a key which she saw lying on the floor, with the thought that she was doing just the opposite of what he wanted. Now, what does the key mean? Asked to associate, the patient remarked, "A key is something you use when you want to get into things. Yesterday my mother tore her dress on a key in the bureau. She was very much exasperated, but I told her she must not blame the key, because it was herself, through her carelessness, that was at fault. I meant that she had made of the key a sort of excuse." The key which the patient picked up in the dream was, then, according to her associations, *something that could be made a sort of excuse, something upon which the blame could be placed when one's own self was really at fault*, and perhaps also something which, like a key, could be used not only when one wants to get *into* things, but, in a different sense, *when one wants to get out of them*. Now, as we know, the patient wanted to get out of working for her rich benefactor. She would have been glad of an excuse to withdraw from his employ. But we have already seen that her neurosis brought about this withdrawal, or, in other words, was the excuse she wanted. In short, the thing that she picked up in the dream, and that her associations showed to be an excuse, was, in fact, her neurosis. She could use it to get out of things. She could blame it when what was actually at fault was her wish to shirk responsibilities.

The first part of the dream is, therefore, historical, and its meaning or latent content may be summed up as follows. "Before I became ill my employer treated me during business hours with so little gallantry and consideration that I wished to leave his employ, so instead of trying to please him I did just the opposite by devel-



oping a neurosis, which enabled me to escape from the office and hide myself at home."

The rest of the dream refers to the question of treatment, for in the dream after she had hidden in the house for some time the scene changed and she started out to join the German Army. Her associations, which I need not repeat, indicated that to join the German Army meant to be brave, and in her case thus represented an attempt to overcome her fear, or, in other words, an effort to be cured of her neurosis.

At any rate, after setting out to join the German Army, or, as we now know it, after taking up medical treatment, she found herself, as has been said, in the office of a man who was King James II, but who at the same time seemed to be a priest. What does this mean?

Her associations to King James II finally led, without her realizing the drift of them, to her speaking of a certain man of about my age whom she had often mentioned to me because it seemed to her we were so remarkably alike. Now, this man's name was James. But, since I was so much like him, she could regard me as a second James, or, in other words, as James the Second. I, then, was the king in her dream. In view of this there is no real incongruity in the fact that James II in her dream seemed to be a priest and sat in an office equipped with a telephone. She looked upon me as a priest because she had to confess to me.

The King's request, "Tell me about the key," was my request for her to tell me about her neurosis. The interruptions which occurred in the dream so that it ended with her story unfinished correspond to the wish-fulfilment. She feared that if she got well she would have to go back to work for her former employer. Hence, she wished interruptions or anything else to occur which would put off the completion of the analysis. In short, the dream shows that a wish to get out of working was not only a factor in producing her neurosis, but also served to delay her recovery. She wished to retain some of her symptoms, for in this way she could avoid having to go back to work. It was this wish which was responsible for the fact that the treatment had apparently come to a standstill.

Let me now recapitulate the points I have attempted to bring out:—

I. That the driving force of a neurosis is derived from those instinctive impulses and longings which for any reason are offensive to, and out of harmony with, the conscious personality of the patient and have therefore been repressed into the unconscious.

II. That the dream, in spite of the obscurity consequent upon the use of indirect methods of representation, can be interpreted as the fulfilment of wishes—wishes belonging to that same part of

the personality from which, in neurotic individuals, the driving force of the neurosis is derived.

III. In consequence of this relationship between dream and neurosis, dream analysis forms the easiest route to an understanding of those forces from which any given case of neurosis springs.

IV. The fact which, above all others, I am anxious to bring out, is that in general the psychological mechanisms which participate in the formation of neurotic symptoms and of dreams should not be looked upon as anything strange and unfamiliar. As I have attempted to show in regard to the relation between desire and neurotic fear, and in connection with the method by which thoughts are represented in dreams, most of the principles of Freudian psychology are, in essence, facts of common knowledge. That this, to many, *seems* not to be the case is largely due simply to a failure to assimilate these formulations with what is already known.

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## A REVIEW OF THE SUBJECT OF CHRONIC INTESTINAL STASIS.

By LOGAN CLENDENING, M. D., of Kansas City, Mo.

"The Operative Treatment of Chronic Intestinal Stasis" (James Nisbit and Co., London, 1915; Paul B. Hoeber, New York), the preface dated 1915, comprehends, apparently, Sir Arbuthnot Lane's latest views on this subject.

The first chapter, by Sir Arbuthnot, is a statement of the case covering 100 pages. The second chapter, The Investigation of Chronic Intestinal Stasis by the X-ray, is by Dr. Jordan. Chapter III, on the Bacterio-Chemistry of the Smal [*sic*] Intestine, is by Dr. Nathan Mutch. Chapter IV is an extract from Dr. James Mackenzie's "Diseases of the Heart"; it is entitled X-disease. Chapter V and VI are papers which Sir Arbuthnot wrote and printed in 1886 and 1887; they are devoted to the exposition of the effects of occupation on the human skeleton, for as he explains in his own airy manner, the laws which govern these skeletal changes are precisely the same as those that govern the soft parts and modify their structures (p. 1).

This is practically a new work, but it is characterized by the same style, the same habitus as the old ones. There is the same unfortunate habit of making unequivocal statements about matters that are in the highest degree debatable. "I wish I were as sure of anything," said the witty Canon of Saint Paul's, "as Tom Macaulay is of everything." So it is. One almost feels sorry for Sir Arbuthnot. He will never feel the pleasure of debate. The idea that there are two sides to the question seems never to have occurred to him. No argument could scratch the surface of that monumental platitudinism. "It is not of British design," is his implied reply to criticisms, and that is all there is to it. These statements, which his awestruck American disciples are fond of calling his laconicisms, fall over each other on every page: "In this manner it kinks" (p. 36), "In this manner material may be accumulated" (p. 34), "The transverse colon drops" (p. 34), "The infection of the food supply is consequent" (p. 51). There are no "we believes," no "it is probables," no "the evidences ares"—just "such and such is, the result is that, this is the cause."

There is the same old lack of any kind of reasonable evidence for any of these things he says that has characterized all Sir Arbuthnot's work. There is the same vague case reporting. There



are no case reports. "Very severe symptoms were relieved by short circuiting" (p. 50). That is all.

Has Sir Arbuthnot no bad results? Some of my friends have done short circuiting and they tell me that they have had some bad results, that if you would find some of their patients you must ask the sexton. That seems a high price to pay for an experiment. They died for a theory. No frenzied enthusiast who ever stuck his red flag on a barricade of stones died more for an idea than they. Has Sir Arbuthnot had no deaths? Where are his tables? In the absence of any specific report to the contrary we must believe that he has not improved his statistics of 1908, when he had an immediate mortality of 19 per cent. and a total mortality of 24 per cent. How many colectomies has he done? How many are improved, how many cured, how many unimproved at the end of five years? And improved of what? "A marked incapacity to perform any mental exertion is a common feature of the condition," writes Sir Arbuthnot at p. 60. Has he had his own colon removed, may we ask?

As a matter of fact neither here, in this volume which is the basis and should be the authority for all our calculations—this book with no list of cases, with hardly a respectable case report, with no table of results, with no report of mortality—neither in this volume, we say, nor in any of the rest of all this mad, maudlin, jumbled, mystic, undigested literature on the subject, is there any hint that the writers of it even surmise the state of the problem they have set themselves. They come to us, the medical profession, and they state that they know the root cause of a large number of distinct and serious clinical entities—rheumatoid arthritis, Still's disease, exophthalmic goitre, duodenal ulcer, trifacial neuralgia, epithelial hyperplasia of the breast, and of a great group of familiar symptoms and syndromes—weakness, loss of weight, enteroptosis, odoriferous perspiration, pyorrhea, etc. They also state that they are able by a surgical procedure to cure these conditions. Now certainly we are very ready to know the root causes of these things. We are more than ready to know a single way to cure all of them; but it is only fair to ask for very distinct proof that the cause referred to operates. It is only fair to ask that the curative procedure proposed is directed towards a real thing. It will not suffice for Sir Arbuthnot to inform us blandly that the matter has been demonstrated to his complete satisfaction, as he does on p. 39. It will not do simply to ignore any of the many questions that are impertinently adverse to the case.

The large intestine through stoppage of the progress of its contents allows toxins and bacteria, or both, to pass through its walls. These cause the diseases and the symptoms—such is the simple explanation of the whole weary subject of human disease. It

seems never to have occurred to the adherents of this doctrine that the whole case rests upon one of the most difficult, the most abstruse and the most undetermined questions in biologic chemistry. No pathologic physiologist has even been asked to give his opinion on the matter. What are these toxins? Where are they elaborated? How do they become absorbed? If they pass through the walls of the intestine, are they demonstrable in the portal vein? Have they ever been isolated? Are they destroyed in the liver? If not, why not? Everyone's colon is constantly filled with feces—why does not every human being absorb these toxins? What circumstances determine the absorption? This is only the beginning of the host of questions we want to ask.

The whole thing is a muddled, unthinkable condition. The conception is sophomoric. It is the sort of general theory of disease we would suppose a young medical student would originate. It appeals to subtle inborn conceptions every man has in his subconsciousness: the contents of the bowel are noxious, smelly material. That is true. Feces contain a high quantity of bacteria. That is true. If they were absorbed into the circulation they would do damage. That is true. When one has not evacuated his bowels for several days one feels headachy, loggy, and has a bad taste. After they are evacuated one feels better. That is true. It is likely that in such acute conditions some absorption does occur. It is simply assumption to say that it happens chronically. There is the practically universal creed that if you can get a sick person, whether he have a fever, a pain or a skin eruption, to have a free bowel movement, everything, just everything will be all right. And upon that rock Sir Arbuthnot has built his church. Upon that mass of ingrained ideas, the basic mental property of both laity and profession, rests the whole basis of our acceptance of his highly elaborate doctrine.

As a matter of fact, though, it is not constipation that is associated with intestinal absorption. In every clinical condition in which we know we have absorption from the intestinal tract, diarrhea is present. Everything that could be called evidence leads us to believe that an actual absorption of bacteria or their fermentative products does occur in many diarrheas with liquid feces containing a very high content of bacteria. That this happens in any but acute conditions, that in constipated subjects with dry feces and a low bacteria count—and mostly dead bacteria at that—there is any such chronic absorption, is purely conjecture and is a conception contrary to all that we know clinically.

This does not amount to saying that in chronic constipation absorption of toxins does not occur. It does amount to saying that there is simply no evidence worth having (with the exception noted below) one way or the other on the subject. Whether it occurs

or not the writer does not know, but he knows that Sir Arbuthnot Lane does not know either. Nobody knows.

In only one condition is there the mildest exception to be made to that statement. It may be granted that to ask the advocates of the theory of intestinal stasis to demonstrate a toxin, the result of putrefactive action in the large intestine, which actually goes through the intestinal wall, is asking a great deal. It may be granted that we have abundant evidence, for instance that the thyroid eliminates a set of chemical elements in the blood although we are not able to isolate them. But the evidence we have is that a certain very definite easily measured clinical condition results under certain conditions of thyroid activity. Now, if the intestinal-stasis advocates could show us a very definite, easily measured clinical condition that resulted after a certain definite easily measured kind of constipation, if they could relate the result with the condition even as closely as we can relate thyrotoxic conditions with thyroid enlargement or thyroid histologic change, we would be satisfied.

In other words, we would be satisfied if we could see the work of the intestinal toxemia, without seeing the toxins. In only one clinical syndrome can they do this: in certain cases of chronic multiple arthritis where there is no focus of infection in tonsils, teeth, nose, ear, lungs, prostate, tubes or urethra, appendix or gall-bladder, some benefit is obtained by removing the large intestine provided the patient lives.

A feeble attempt, as if Sir Arbuthnot were salving his mental conscience, is made in this volume to give an exposition of the chemistry of intestinal stasis in Chapter III, which is by Dr. Nathan Mutch, and is entitled the Bacterio-Chemistry of the Small Intestine. His conclusions, three in number, will suffice to give an idea of the penetrating quality of his work:—

“1. Infection of the small intestine with coliform organisms can be inferred when indoxyl, indol-acetic acid, or hydroxyphenyl acid appears in the urine of a constipated patient whose gastric secretion is not deficient in hydrochloric acid.

“2. *Bacillus amnophilus* infection of the ileum of a sufferer from intestinal stasis is indicated by a subnormal blood-pressure.

“3. Alimentary infection with *staphylococcus citreus* is revealed by the presence of the symptom-complex known as Still's disease.”

It is all delightfully simple, you see. If you have indicanuria, hypotension or Still's disease, it is perfectly certain you have intestinal stasis. But the chapter by Dr. Mutch is not enough.

There is, too, a chapter by Dr. Jordan on the use of the roentgen ray in the diagnosis of intestinal stasis. There are several *x-ray* pictures of bismuth in the terminal ileum and of ptotic transverse colons and so forth. These pictures are uniformly unaccompanied



by information telling how long the bismuth had been in the terminal ileum, the rate of passage through the digestive tract, and so are utterly worthless for any purpose whatsoever.

We are just now in a particular period of development in the use of the *x*-ray in abdominal work, and it is easy to prophesy that this will have to be succeeded by another period of discussion and investigation before the true value of this means of diagnosis can be assessed. In the first flush of our interest in looking at stomachs and colons that have been filled with bismuth, we have been highly astonished to find that both take a form and assume a position far different to what we had been led to expect. We find an individual complaining of a pain in the epigastrium, and on viewing him with the stomach filled with bismuth we see that it is a long thin tube with the pylorus just below the umbilicus. We see patients who are constipated and instead of finding their transverse colons stringing across the abdomen just above the umbilicus, as they are pictured in Gray's and everyone else's anatomy, we see that they are in the pelvis or crumpled in the iliac fossa. There, we say, there plainly is the seat of the trouble. But, alas for the simplification of science, we find, later, many colons in the pelvis of unconstipated individuals, we find many stomachs below the umbilicus in those who have no gastric distress.

The thing that roentgen ray workers need is a very good strong dose of the normal. They are all of them working in clinics where there are a large number of sick people sent them, and have little opportunity to plot the normal. It is only when we have the unbiased record of many hundred people of all ages and sexes and shapes, who have no digestive disturbances whatsoever, and have determined the limits of the normal, that any judgment can be passed on the mass of *x*-ray plates representing ptosis and stasis. Prophesy is a rash thing but, we believe when that day comes (basing one's judgment on the appearance of the parts of the digestive tract examined in patients whose symptoms point to a different part) that it will be agreed that the position and even the shape of the stomach and colon are subject to the widest imaginable variation, that the rate of emptying of different parts of the digestive tract, while much more stable, has wide limits, and that filling defects and incisuria are of the most considerable significance.

At the present time, however, any demonstrations of intestinal stasis, or movable cecum, or ptotic colon, or incompetent ileocecal valve are absolutely unconvincing. In the words of Sir James Goodhart: "What is a kink to us is not necessarily a kink to the intestine." The cervix, if we were using the method of the roentgenologists, is a kink, even an annular constriction, for the pregnant uterus; but as a matter of experience it is not infrequently over-

come. On the operating table, in looking at the intestines of patients who have been shown to have an ileal kink or colonic stasis, it is notable that they show, in the musculature, no evidence of having had an obstruction to overcome; the walls of the intestine are not hypertrophied; in many cases they are even quite thin. Now, there is no pathological principle more immutable than the one which states, that if an unstriped muscle is given more work to do it will hypertrophy; and of this principle we encounter countless examples in the intestines of cases, with a chronic obstruction, such as a carcinoma. Why have we no hypertrophy then, in the cases called intestinal stasis, with kinks and membranes and adhesions? To say that the intestinal wall is thin, showing that it is not able to furnish propulsion to the feces, and is therefore the cause of the stasis is, with the greatest respect to the gentlemen who advance that idea, to promulgate an abysmal absurdity. It is an abysmal absurdity because they manufacture their pathology, as do the osteopaths with their displaced bones, out of the circumambient atmosphere.

In the same hospital where Sir Arbuthnot has lived his surgical life there is another man who has made a real and conscientious investigation of the subject of constipation. He is Dr. A. F. Hertz, and he has embodied his ideas in a little book entitled "Constipation and Allied Intestinal Disorders." He plotted a chart of the normal time required for the passage of a meal through the intestinal tract. This work has, so far as the writer knows, never been checked and never repeated. It stands in immediate need of such checking, for it is improbable that Hertz's observations covered many cases.

Hertz found that in 90 per cent. of cases of constipation, the constipation was confined to the terminal portion of the descending colon, the sigmoid or the rectum. In these extremely constipated people some of them not going to stool for weeks, the meal passed through the stomach, the small intestine, the cecum, the ascending, transverse and descending colon on normal time, and was only halted at the terminal position of the intestinal tract. It is worth noting that it is just into this portion of the colon that Sir Arbuthnot Lane would shunt his intestinal stream in the operation of ileosigmoidostomy. He would shut off and remove the very parts that in 90 per cent. of all constipated individuals have a normal emptying rate.

But what, it is not unreasonable to ask, what are these patients suffering from if not from intestinal stasis? That, of course, is a thing that is quite undeterminable. Sir Arbuthnot has not taken us sufficiently into his confidence for that: he has not given us any case histories to read. Some of his admirers in America have done that; only one or two, however. It would be unkind

to say what springs to the lips upon the perusal of these case-records. There is one (Williams, *Annals of Surgery*, September, 1915) which reports chronic intestinal stasis as produced by obstruction at the ileocecal region and at the hepatic flexure. In this truly remarkable contribution 19 cases are reported; of these in 8 the appendix is reported as diseased and removed; in 6 the appendix was normal in appearance but removed; in 5 the operation was done in postoperative appendectomies. What are we to think when such cases are reported as chronic intestinal stasis?

Indeed, no one is able, or at least no one is willing to outline a clear-cut definite set of symptoms for intestinal stasis or intestinal membranes, or intestinal bands or intestinal kinks. It is there that one great difficulty has arisen in coming to any conclusion about this whole matter. I tell you I have looked through reams of this literature in vain, searching for someone's definite statement of definite symptoms ascribable to these conditions.

And when you turn from the slush of words to your patients, what do you find? You find patients that ought to have membranes have no membranes, you find patients who have membranes galore and are so ungrateful as not to have constipation. One case in point, a male, was operated on for chronic appendicitis. We found extensive adhesions all along and binding down the entire ascending colon. After he had recovered from the first effects of the ether and the operation, we asked him very carefully about the condition of his bowels. His answer, to quote him quite exactly, was that that was one thing he had never had to worry about, that he had never bought a nickel's worth of cathartics in his life, and that his bowels had moved at seven o'clock every morning of the world since he was born.

No, I cannot say what Sir Arbuthnot's patients are suffering from. I only know that the more carefully I examine any group of patients, the more completely do such things as chronic intestinal stasis melt out of my records. Some of them may be chronic appendicitis, some cholecystitis, many of them, I think, are cases with unstable nervous systems, who are much more given to thinking about their insides than about getting into the kingdom of heaven. In this connection we recall the remark attributed to Dr. Theodore Janeway by Dr. J. B. Deaver, to the effect that he had never made a diagnosis of chronic intestinal toxemia in all his life.

It is, however, when one reaches the recommendations for surgical treatment of these cases that one finds the most bewildering confusion. If you find anything loose in the abdomen, make it tight; and if you find anything tight, make it loose; that seems to be the general rule. But the schools of tightness and looseness are by no means drawn up in opposing camps. Indeed, they are



bound by no narrow allegiance. You will find one single author advising you to sew up the cecum on one page, and telling you how he divides ileocecal adhesions on another. "If you see a head, hit it," was the happy motto of the lads who used to go to Donnybrook fair. The modern membranac surgeon goes to his Donnybrook fair every day: "If you see anything inside the abdomen, do something. If it is tight make it loose, if it is loose make it tight, untie the organs, let them float, or else on Mondays and Wednesdays and Fridays let us sew them all up to the abdominal parietes."

To summarize: In the matter of pathologic physiology, we believe it far from proved that there is any chronic absorption of toxic material from the intestines; as to pathologic anatomy, there are too many discrepancies in the description of bands and kinks and membranes to admit of any conclusions; as to diagnosis there is no agreement on any set of symptoms (save only chronic arthritis) attributable to intestinal toxemia; and, diagnostically, the use of the *x*-ray is valueless if it shows nothing but the position of the gastro-intestinal organs. As to surgical treatment, the mortality of colectomy is too high, the plan of ileosigmoidostomy is both illogical and unsatisfactory, and the division of adhesions or the fixation of organs is either without any results or pernicious in effect.

We have no doubt whatever that there are many people, who have complained for many years of a train of ills, who have been operated upon, and had some changes made in their stomachs or colons or cecums or sigmoids and are much better after the operation. But that evidence is out of court. The osteopaths can show us that. So can the chiropractics, so can the Christian Scientists. I can collect, if I wish, a set of patients suffering from the same train of ills and give them an anesthetic and gouge holes in their lumbar muscles and have them whole and hearty, singing my praises within a year.

The formula for those cures is the same whether you lay on your hands, or harness the lightning, or give them pink radium water. It is this:—

A patient came to me complaining of

{ backache,  
biliousness,  
headache,  
stomachache,  
constipation,  
gone feeling,  
tired feeling,  
toxemia,

and I { gave him static electricity,  
pushed a vertebra back in place,  
did an ileosigmoidostomy,  
explained that he had 'fallen into error,' and to-day he is  
alive and well, and twenty times the man he was.

I have here before me, as I write, a whole pile of this weary and unconvincing literature on intestinal stasis and allied subjects. And as I finger over the curious pages written by these grave men who have wagged sage tongues in high places, my thoughts have gone back to the medical life of other days. I have thought of all the buried and forgotten labors of those wise and sage English physicians in the eighteenth century, with their interminable discussions about blood-letting, of how they are thrust, like foolish prophets, forth; and of all their time we remember barely a little more than the work of a quack who stole the secret of the obstetrical forceps, of an old woman who brewed herbs in Shropshire, and of a red-faced country doctor in Gloucestershire by the name of Edward Jenner. I think of all those pompous German professors of the same day, who waited on choleric kings and accouched phlegmatic queens, and that there is not one whose name we would recognize save only he who wrote a little pamphlet on percussion, a pamphlet which seemed to die a-borning, and was not even well enough known to be laughed at by his learned colleagues. And I wonder in this mood, whose names, a hundred years from now, will be remembered from this great age of hard thinking and close investigating in which we all live and work.

Those great men who lived in the eighteenth century, after all deserve much of our sympathy. Thinking is really, say what you will, very difficult. One has a proposition presented to him, and if he begins to think about it he thinks of several objections to it, and then he thinks of some objections to the objections, and then of some objections to those objections. And if he experiments he will no doubt find a lot of utterly contradictory things. It is really quite annoying and highly confusing.

So I suppose the easiest way to avoid thinking is to adopt a panacea. The lure of the panacea—how potent it has been! It is within the memory of man living that the excellent Haig was hailed as the High-Priest of uric acid. There was as much to be said for uric acid as there is for intestinal toxemia: it cured for a time its thousands, but the theory that was built about it caught cold and died. There was a time when we could cure all female ills by removing ovaries, and a little later time when the floating kidney was the origin of so much of our trouble.

There is a story of a quack physician in Bath, England, who had proclaimed that he could cure a long string of diseases by dilating the rectal sphinctre: and he had a highly scientific explanation of how such a thing could be. His claims, however, were considered unsound by a number of conservative doctors in London and they decided to investigate the matter; they selected a representative, the most sedate and conservative of their number, who was to journey to Bath and denounce the imposter. This dignified gentle-

man made the trip, but, on his return, to the astonishment of his colleagues, he announced that the quack had persuaded him to have his own rectum dilated and that he had done so, and received vast benefit from the procedure.

As we think of all these things, we seem to see forever in doctors' waiting-rooms that band of unhappy persons called this and that—neurasthenics, neurotics, nervous people, cranks, hypochondriacs, whom we so seldom understand and whose cases we so often bungle, destined forever to be the victims of panaceas. When will the day come when they will cease to be operated on, to be massaged, to have static electricity turned on them, to have their stomachs washed out, their rectums dilated, their turbinates removed, their uteri curetted! There are those pompous persons who are fond of saying that the day has gone by when such things can happen, who are always telling us that a new morn is breaking, that the watchers on the house-tops shall not have watched in vain. But we must confess that we have not so much faith. We are not pessimistic, but we do not expect to see humanity revolutionized over night any year in the present decade.

There will be other panaceas, there will be other delusions, and the most we can do is to be ready to receive them with a critical, as well as open mind; to ask for proof, to hold fast that which is good; to smite if possible error as we see it; and to remember that there is no zest quite so keen as that which comes from pointing out the flaws in the reasoning of a friend.



CLINICAL NOTES ON INFECTION WITH *STRONGYLOIDES INTESTINALIS*, BASED UPON A SERIES OF TWENTY-THREE CASES.

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From the studies of Normand to those of Strong<sup>1</sup> and Thayer,<sup>2</sup> in 1901, the reports upon infections with *Strongyloides intestinalis* cannot be accepted as excluding other infections, and the symptoms described are not all to be considered as certainly due to *Strongyloides*.

With the exception of Gage,<sup>3</sup> who reports 15 cases, there have since been but few series of cases reported.

During the last fifteen months, there have been received at the Cuyamel hospital 23 patients with *Strongyloides intestinalis*. Of these, 3 were pure cases, in whom repeated examinations failed to reveal any other infection or disease of any kind, and 2 others became pure cases after the cure of a coexistent tertian malaria, making a total of 5 pure cases for study.

The following analysis of symptoms is based upon these 23 cases; but no symptoms are ascribed to *Strongyloides* on the authority of the writer, excepting such as occurred in at least one of the 5 pure cases.

Four stages of the disease may be described.

I. *Stage of Invasion*.—Van Durme, Marzocchi, Daland, and Looss, have demonstrated the route through the skin, similar to that of *Ancylostoma duodenale*. In one of the pure cases, the eruption was observed. It consisted of fine red papules, slightly elevated, of irregular distribution, situated on the dorsum of the feet, between the toes, and on the ankles. The intervening skin was reddened and excoriated from scratching. The eruption is more intensely itching than that of ankylostomiasis, and seemed to have less tendency to produce pustules. The patient is subject to slight brief elevations of temperature and to a vague feeling of malaise, with a capricious appetite and slight headaches. These patients present an exceedingly high eosinophilia. In a case, which was complicated with *Trichuris trichuria*, the eosinophiles reached 63 per cent. at one examination. The eosinophilia of strongyloidosis is peculiar on account of its great fluctuations. This is probably the cause of the wide variation in the statements of different authorities. Price<sup>4</sup> stated that eosinophilia does not occur, while Baetjer<sup>5</sup> reports 45 per cent. of eosinophiles, and Eustis 56 per cent. (reported by Gage).

In describing the pathology, Strong states that no eosinophiles were found around the females imbedded in the tissues, while Brown<sup>6</sup> found large numbers.

It seems that every fresh invasion of the parasites is accompanied by a pouring out into the blood of large numbers of eosinophiles; but that at other times there is but little tendency to their production.

One of these cases had a slight cough for three weeks, with signs suggesting a slight broncho-pneumonia. As in cases of cough after the ground itch of uncinariasis, the sputum was abundant, thin and watery. No larvæ were recovered from the sputum, but it seems probable that the cough was to be ascribed to their passage through the lungs.

II. *Latent Stage*.—Thirteen of the 23 cases remained throughout the entire time in this stage. One when first seen was in this stage, but six months later reported with a very severe type of the third stage. The long period during which there may be no marked symptoms accounts for the number of observers who have minimized the harmful effects of this parasite.

Grassi has shown that exacerbations of the infection occur in cases where re-infection from without the body may be excluded, and that immature females are to be found in patients long resident in hospitals.

At Cuyamel, filariform larvæ have eight times been observed in the fresh stools. Gage found filariform larvæ in fresh stools and found larvæ in all layers of the intestinal wall and in the lungs. Thayer, and all subsequent writers on the pathology of the condition, mention larvæ situated beneath the intestinal epithelium. In many cases, if carefully observed, the numbers of the larvæ will be seen undoubtedly to increase, after making all allowance for fluctuations.

In all the treated cases, unless the cure was complete, both in the series of Cuyamel and in the reported cases, after a lapse of time the number of larvæ increased, and the patient relapsed. There is, therefore, abundant ground for the belief that *Strongyloides* is capable of re-infecting the host from within the body, and that any latent case is likely to develop symptoms of the later stages.

The patients in the second stage are likely to show the constitutional symptoms of the first stage at intervals, owing to incursions of the parasites. They report at times light febrile attacks, with malaise and anorexia. They are often constipated. There is frequently a peculiar irritable condition of the intestine, in which any laxative sufficient to act at all will produce a number of violent movements which leave the patient exhausted. Any indiscretion in diet is likely to bring about an attack of indigestion.

III. *Stage of Diarrhea*.—Normand considered this parasite as the cause of Cochin China diarrhea. A very interesting discussion

followed, in which it was shown that other factors enter into the causation of this disease, and in which Grassi and others contended that *Strongyloides* alone cannot cause diarrhea. Since 1911, all writers, aside from those reporting only a few cases in Stage II or IV, have ascribed certain cases of diarrhea to *Strongyloides* alone, with the single exception of Darling.<sup>7</sup> It should be noted that Darling did not consider an average of six stools a day as diarrhea, on the ground that cases of malaria, which have received thymol, often have as many. On the other hand, Gage reports at least intermittent diarrhea in 14 out of 15 cases. In endeavoring to reconcile these conflicting reports, it would appear that Gage regarded as diarrhea many cases of the irritable intestines described under Stage II, while Darling, on the contrary, refused to consider anything less than a continuous diarrhea of sufficient severity to incapacitate the patient.

The diarrhea in this stage is usually intermittent. In one case of pure infection it was continuous for three weeks when the patient applied for relief. It is of a peculiar character, nearly all the cases stating that they suffer no pain or colic, and it is usually characterized by an inability to retain the stools for more than a few minutes. It seems to be an exaggeration of the intestinal irritability of the second stage. Nearly all the writers describing cases of diarrhea, due to pure infections, comment upon these two peculiarities. The movements are usually free from blood and from any perceptible quantity of mucus, unless either hemorrhoids or dysentery are also present. The stools are thin and watery and are characterized by the presence of many pus cells, or even macroscopic pus, and by numerous rhabditiform larvæ. Ova and filariform larvæ are occasionally present, the former usually after purgation; the latter, during constipation.

There is loss of appetite, and, if the course of the disease is unchecked, emaciation and weakness. There is often a peculiar haggard facies, which, taken in connection with the painless and uncontrollable diarrhea, may cause the diagnosis to be suspected from the clinical symptoms alone.

After persisting for weeks or months, the diarrhea is usually relieved, either as a result of the patient's learning to diet himself so as to avoid it, or of the nervous mechanism of the bowel becoming so accustomed to the irritation that it refuses to respond. The patients then pass into the fourth stage.

IV. *Stage of Neurasthenia.*—This stage sometimes directly follows Stage II. The general characteristics of this stage are those of neurasthenia from any cause. Emaciation, loss of appetite, vertigo, a pulse readily becoming rapid on slight exertion, general weakness, and quick fatigue, are usual symptoms. The bowels are usually constipated, and there may be present more or less of the intestinal ir-



ritability of Stage II. Any of the nervous symptoms of neurasthenia may appear. The anemia is usually very moderate in proportion to the weakness and loss of weight.

#### SPECIAL SYMPTOMS.

*Blood.*—Anemia was very moderate in all of this series, 75 per cent. the lowest recorded in a pure case, and was remarkable for the promptitude of the response to iron, a few doses being usually sufficient to bring the hemoglobin to 90 per cent. or above. Baetjer reports 30 per cent., Hall<sup>s</sup> 65 per cent. De Silvestre, Valdes and others report cases of anemia, but the greater number comment upon the absence of marked anemia. The variability of the eosinophilia has been described above. A Romanowski stain of blood taken shortly after an outbreak of eosinophilia often shows a rather peculiar phenomenon. It is recognized that recently formed eosinophiles show a physical basophilia equal to, or greater than, the chemical eosinophilia. As, in these cases, nearly all of the eosinophiles are recently formed, the blood presents the picture of a high leucocytosis, in which a portion of the polymorphonuclears are of the ordinary type, and the remainder very deeply stained, brown, blue, or jet black. On close examination, these last are seen to correspond with ordinary eosinophiles in form and staining reaction of nucleus, in size and in structure. A few ordinary eosinophiles may be present. This phenomenon sometimes occurs in sudden severe infections with other parasites, but more frequently, and in higher degree, in infections with *Strongyloides*, and the occurrence of a high percentage of amphophilic eosinophiles should arouse the suspicion of the presence of *S. intestinalis*.

Teissier reported filariform larvæ in the circulating blood; but the observation has not been confirmed, and it is probable that his case was one of mixed infection.

*Urine.*—During the diarrhea the urine is concentrated. No other changes can be attributed to the parasite.

*Hemorrhoids.*—Two of the cases believed their trouble to be hemorrhoids, and on examination moderate-sized piles were found. Both cases were clinically cured of the hemorrhoids by thymol.

*Fistula in Ano.*—Price reports a case of this complication. It is possible that the port of entry was afforded by the parasite.

*Arthritis.*—One of the cases (complicated with *trichuris* and *necator*) was subject to attacks suggesting mild arthritis deformans, of the hypertrophic variety, relieved by thymol.

*Pneumonia.*—Gage reports pneumonia followed by a purulent condition of the lungs, and death. Larvæ were present in the sputum, and at autopsy in the air sacs, alveolar walls of the lungs and in all the coats of the intestines.

*Creeping Eruption.*—Looss states that in older patients the larvæ

may not penetrate all the layers of the skin, but, instead, produce a form of creeping eruption.

*Tinnitus Aurium*.—Barbagallo reports a case.

*Paralysis*.—Eustis reports a case of loss of knee-jerks and peroneal paralysis.

*Edema*.—Reported in very few cases.

#### DIAGNOSIS.

The larvæ are readily found, and an examination of the stools is all that is necessary to determine the presence of the infection. However, a most searching examination of the fresh stools, obtained after a saline, if necessary, should be made for protozoa, and the symptoms should not be attributed to *Strongyloides* until both protozoal and bacterial dysentery have been excluded. Sprue, pellagra, lues, tuberculosis, carcinoma, and malaria, should be excluded by appropriate examinations, and the ova of other intestinal parasites, of course, noted.

#### PROGNOSIS.

With the exception of the case of Gage, there has been no fatal case reported which it seems justifiable to ascribe to *S. intestinalis*. In this case, it seems probable that the pneumonia and resulting death were due directly to the parasite. If this case is accepted, it seems possible that a few of the other fatal cases with pneumonia may also be ascribed to *S. intestinalis*. The fatal cases with diarrhea all had a coexistent infection with intestinal protozoa, or else an ulcerated condition of the intestine is mentioned.

A critical study of the pathological reports makes it appear that the only changes (aside from those in Gage's case) which can be directly ascribed to *S. intestinalis* are the atrophy of the epithelium and surrounding tissues of the crypts of the intestines, and the infiltration with round cells or eosinophile cells in the vicinity of the worms which are buried in the mucosa. The occurrence of intestinal ulceration should, therefore, be considered as very strong presumptive evidence of a protozoal or bacillary dysentery. The other pathological changes were only occasionally encountered, and are such as occur in any series of autopsies; there is no reason for attributing them to *S. intestinalis*.

The distribution of cases in this series was as follows:—

	Pure	Mixed	Total
Stage of invasion.....	1	1	2
Latent stage .....	2	12	14
Stage of diarrhea.....	1	4	5
Stage of neurasthenia.....	1	1	2
Total. . . . .	5	18	23

One of the latent cases developed diarrhea six months later. The diarrhea was relieved in all cases; one was cured, and four developed neurasthenia later. These four, with the two already in the fourth stage, were reduced to the second stage by treatment. Three cases have so far been entirely cured, the cure being confirmed by examination several months later.

If both diseases remain untreated, strongyloidosis is much less serious than uncinariasis. It very rarely causes death, does not produce severe anemia, and does not cause as grave changes in the various organs of the body. It may remain latent for long periods. A consideration of the relative frequency of the two diseases makes it evident that the patient is not so serious a menace to the health of the community as is the hookworm subject, as the disease is clearly not so readily communicable. On the other hand, if both diseases are to be treated, hookworm must be considered the less serious. Uncinariæ are readily removed by treatment, and do not increase within the body of their host. Strongyloides is difficult to destroy or remove, and if any living parasites are left in the body, they will gradually increase in number and the patient will revert to the same or a worse condition than that before treatment.

The infection should never be taken lightly, but should be considered as a force constantly at work undermining the strength and resistance of the body. Sooner or later the stages of diarrhea and neurasthenia are likely to develop, and there is constant danger that the lesions caused by the parasites may afford a port of entry for intercurrent diseases. All cases should be persistently treated until thoroughly cured.

#### TREATMENT.

The writer has learned by sad experience to consider no case cured until examinations made at least two months later have shown the feces to be free from larvæ. As far as can be judged from the reports of cured cases, they are all based upon clinical cure, or at most upon freedom from larvæ at the time of discharge. Only brief mention of them is therefore given.

Seifert found male fern of no value up to gr. 20 ethereal extract. Toth cured 16 cases with male fern. Perroncito cured 30 cases with male fern, gr. 2-4 of extract, or gr. 12-30 of ethereal extract daily for six or more days. De Silvestre cured one case by male fern, gr. 8 daily for two days. Valdes cured one case in two months with male fern, thymol and santonin. Barbagallo cured one case with gr. 2 daily ethereal extract male fern for twenty days, dead females occurring in the stools. Strong finds thymol in large and repeated doses efficient in mild cases, but of no avail in severe ones. Cline<sup>9</sup> reports improvement after large doses of thymol weekly for six weeks, male fern two days a week for eight weeks, and calomel and santonin three days. Valdes cured one case in two months with all three



anthelmintics. Price reports no case cured, not even after two treatments of thymol of 180 gr. each. Brush<sup>10</sup> reports treatment unsatisfactory. Baetjer reports apparent cure after two treatments of 120 gr. thymol. Moore<sup>11</sup> reports that 60 gr. of thymol daily did not cure. Teissier reports decrease in number of parasites after mercurial treatment. Simon reports (to Gage) ipecac useless. Eustis investigated the larvacidal power *in vitro* of thymol, santonin, male fern, calomel, quinine bisulphate, glycerine, formin and salicylic acid. He found them all useless but the last two. He reports the cure of a Stage IV case with disappearance of embryos, by gr. 3 of salol every three hours. Two of the cases of this series were treated with salol, 40 gr. daily, for one and two weeks without effect upon the larvæ; but the patients were upon full diet. In a personal communication, Eustis states that a liquid diet is necessary to success with salol, and that he has records of a series of cases so treated, which he will publish after the lapse of sufficient time. Darling<sup>12</sup> found thymol 1:1000 to kill filariform larvæ *in vitro*. Stiles<sup>13</sup> found thymol unsatisfactory, but encouraging results from flowers of sulphur, 5-15 gr. twice daily.

The 3 cases cured in this series were cured accidentally in the treatment of concurrent infections, but they have all been seen several months after treatment and have remained free from larvæ. One was cured by two treatments of 75 gr. thymol, one of 120 gr. extract male fern, three of 75 gr. thymol; these six treatments being each preceded by 5 gr. each of santonin and calomel given the night before, and were given every other day; following them, the patient ate the kernels of two ounces of pumpkin seed daily for one week. The second, a mild case, was cured by five treatments of 75 gr. of thymol, given every fourth day, each preceded by santonin and calomel. The third, a syphilitic case, received 75 gr. of thymol preceded by santonin and calomel, and a combined treatment of salvarsan and mercury, the latter given as biniodide and pushed to the point of mild salivation. A fourth case refused the second treatment with thymol, and was given calomel  $\frac{1}{4}$  gr. daily. He has improved markedly in condition; the larvæ have decreased to less than one-tenth of their former number, and those passed are either dead or are so sluggish, small and undeveloped, that they present a striking contrast to those from an untreated case. Mercurialization has not yet been attained in this case. All the other cases showing symptoms have been clinically cured, and from a few the larvæ have disappeared; but the time is too short to pronounce them cured.

It was found that both thymol and male fern are more effective in large doses, if given at close intervals, and if preceded by santonin and calomel. A consideration of the above material seems to justify the following conclusions.

## CONCLUSIONS AS TO TREATMENT.

If the patient can endure the treatment, strongyloidosis may be cured by frequent administration of either thymol or male fern, or both in alternation, continued until the larvæ, living or dead, have disappeared from the stools. The doses should be as large as the patient can take, and the interval not greater than every other day. The effect of treatment is enhanced by the administration of san-tonin and calomel the night before, as often as possible without the danger of mercurial poisoning.

If the patient cannot endure such a treatment, there is excellent prospect of cure by the continuous oral administration of salts of mercury, pushed to the point of mild salivation. The cure will be hastened, if the patient can take occasional doses of thymol or male fern.

There is urgent need for a more general recognition of the serious nature of infections with *S. intestinalis*, and of the necessity for energetic and persistent treatment. There is also a great need of reports of cases in which the treatment has been accurately recorded, and the patient examined several months thereafter.

Full details as to history, description of parasite, pathological anatomy, together with a complete bibliography, including all the earlier references, with excellent abstracts of the more important articles, may be found in the papers by Strong and Thayer. The forms found in animals are described by Darling<sup>7</sup> and von Linstow.<sup>14</sup> A variation is described by Plasencia.<sup>15</sup>

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- <sup>10</sup> Brush (*Southern Med. Jour.*, 1908, Vol. I, p. 248).
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- <sup>14</sup> v. Linstow (*S. Fuellerborm, Centralbl. fuer Bacteriol.*, 1905, Vol. XXXVIII, p. 532).
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## THE TREATMENT OF OZENA AND ASTHMA WITH AUTO-GENOUS VACCINES.

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By CHARLES L. KLENK, M. D., of St. Louis.

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In 1914, I endeavored, in cooperation with Dr. Louis K. Guggenheim, of St. Louis, to repeat the experiments of Hoffer and Koppler of the Chiari Clinic, Vienna, on the cause and treatment of ozena.

After numerous experiments with rabbits we tentatively agreed that the coccobacillus of Perez was the true cause of ozena. Our experiments were not complete, however. Since then, with improved technique and the most generous cooperation of several local physicians, we were enabled to continue these experiments on a larger scale. In view of the results obtained we can at this time, without fear of contradiction, say that the organism discovered by Perez is the true cause of ozena.

We regret that so few investigators have taken up this line of work as we are very anxious to provoke criticism of our findings and conclusions.

Dr. Henry Horn, of San Francisco, is, we believe, the only investigator who has done anything with the matter and come to any definite conclusions. He agrees with the findings of Hoffer, but, according to his own statements in a paper recently read at the meeting of the American Medical Association, says that his findings are not conclusive. Dr. Horn seems to have had considerable difficulty with the agglutination tests which Hoffer states are quite simple. We agree with the original investigators as to the simplicity of these agglutination tests, especially those cases from which we were able to obtain a pure culture. Several cases from which we obtained negative agglutination sera are in our opinion not true ozena. In no case which gave a positive Wassermann reaction were we able to get an agglutination serum.

The vaccines prepared by Hoffer as well as those prepared by Dr. Horn were not really autogenous, but a combination of 7 or 8 strains of the coccobacillus, with the addition of a bacillus which Dr. Horn says is a coccobacillus normally found in the nose and mouth of the dog. We, however, make our vaccines with the organism taken directly from the patient to be treated. In nearly all cases giving the best results, we used vaccines composed of a pure culture of the coccobacillus isolated from the patient's nose.

Our vaccines are usually prepared from the semi-liquid portions of the greenish, stinky crusts. At least 10 to 12 cultures are



made upon albuminized agar contained in large wide tubes. After twelve to eighteen hours of cultivation the various colonies are transferred to similar agar slants and again incubated for twenty-four to thirty-six hours. If a pure culture results, a suspension in normal salt solution is made and the number of bacteria in a cubic centimetre determined. 100,000,000 to 500,000,000 bacilli are injected into the peripheral vein of a rabbit's ear. In twelve to thirty-six hours 3 out of 5 rabbits die, and if the coccobacillus is present it can be obtained in nearly pure culture from the nose of the rabbit. In several instances absolutely pure cultures were obtained, with the somewhat modified typical odor of the original condition. If the patient's serum from which the organism has been isolated agglutinates, the bacteria obtained from the rabbit in a dilution of at least 1-30, the findings are positive and the organism is used in preparation of the vaccine. Frequently it is difficult to obtain a pure culture and if so an emulsion of the original culture is made and 2 to 3 c.cm. are injected into the rabbit; and if the coccobacillus is present in sufficient numbers, a pure or nearly pure culture is obtained from the rabbit in twenty-four to seventy-two hours. In no instance did we find any other bacterium present in the nose but the Perez bacillus, if cultures were used in which we were positive that the coccobacillus really was present.

After we obtained the growth which conformed to all necessary tests, both microscopically and macroscopically, in which the typical odor was present, suspension in salt solution, to which a 0.5 per cent. tricresol was added, was prepared and the same incubated for twenty-four hours. After proper controls to insure sterility, the vaccine is transferred to small ampoules for use.

We do not wash the bacteria as recommended by some to remove the so-called extraneous substances, as we have learned that the coccobacillus produces an extracellular toxin which seems to be necessary for the best results. The results with washed bacteria have not been as good as those which were not washed.

The vaccine is put up in small ampoules of single dosage. The tubes are numbered from 1 up. Tube No. 7 usually contains 1 c.cm. of the concentrated suspension. Tube No. 1 contains 1 drop or approximately 1/15 of 1 c.cm. Tube No. 2, two drops; No. 3, 4 drops; No. 4, 6 drops; No. 5, 10 drops; No. 6, 12 drops; No. 7, 15 drops or 1 c.cm. of the concentrated suspension. The balance, if any, in proportion.

We find it very unsatisfactory to begin with the full amount usually recommended. Our method cuts the initial dose in half and gradually increases. This procedure has been carefully watched and found to be most successful in the average case.

Directions accompany the vaccine as follow:—

Inject contents of tube No. 1 (if after twenty-four hours no reaction such as local pain, redness, slight swelling and occasionally a slight elevation of temperature, inject No. 2). If no reaction after No. 2, inject No. 3 in twenty-four hours. If a reaction occurs after No. 1 or 2, the next injection should be given in seven or eight days, and all other injections at the same interval. If the reaction is too severe after an injection, such as headache, vomiting, backache, perhaps collapse, severe chills and a very high temperature, the dose is too large. After this reaction has completely disappeared,  $\frac{1}{2}$  of the next tube should be given.

We find that the results following the treatments in the average case are more or less similar and characteristic:—

*Tube No. 1.*—Twenty-four hours after injection, local pain, redness, and possibly a slight elevation of temperature. This does not occur regularly, however.

*Tube No. 2.*—Twelve to twenty-four hours after injection, local tenderness increased with pressure, redness, slight elevation of temperature, and in a few cases slight watery nasal discharge.

*Tube No. 3.*—Twelve to twenty-four hours after, local pain usually marked, area of redness very large, 1 to 2 degrees of fever, and nasal discharge quite profuse. In five or six days patient may develop a typical acute rhinitis, accompanied by severe sneezing, pain in nose, profuse seropurulent discharge.

*Tube No. 4.*—Slight tenderness, slight redness, no fever or perhaps very slight fever, and a marked reduction of discharge.

*Tube No. 5.*—Slight local reaction, no fever, and a marked loosening of crusts, odor may at this time be somewhat lessened but is usually noticeable.

*Tube No. 6.*—Slight local reaction, no fever, complete disappearance of discharge and odor not so marked.

*Tubes Nos. 7, 8 and 9.*—Reaction about the same, but a marked difference in the odor, which gradually becomes less noticeable.

*After Tubes No. 10, 11, 12, etc.*—In most of the cases the odor has completely disappeared and many believe they are well.

Our results thus far are very gratifying. We are certain that after a time, with improved technique, all cases of ozena will be markedly improved and ultimately cured.

Many of the patients who have been under treatment, with the exception of the atrophy, appear cured. Some of the patients who are not doing well did not give positive agglutination tests, and in others we were not able to isolate the coccobacillus.

The autogenous vaccine for the treatment of asthma is, at present, in the experimental stage. We have not had the opportunity to try the vaccines on more than 12 or 15 cases, but the results obtained are very gratifying.

We have not been able, nor have we attempted, to isolate a specific

organism in the preparation of the vaccine, but use all pathogenic bacteria found in the material submitted.

The methods as employed in preparation of the ozena vaccine are used with the exception that no animals are required.

We shall on the approach of the colder weather be able to continue our line of investigation, and if the physicians continue to furnish the patients, we shall in the early spring present a more conclusive report on the value of this treatment for asthma.

A number of typical cases of ozena and asthma were referred to us for the vaccine treatment. The vaccines were administered to the patient by the attending physician. A few received the injection in our laboratory.

CASE I.—C. W., female, *æt.* seventeen. (Referred by Dr. C. F. Pfingsten, St. Louis). Marked atrophic rhinitis with purulent crust formation of decided ozenic odor. The distressing odor and crusting in the nose were the chief symptoms complained of, except occasional headaches. There was no evidence of any suppurative accessory sinus disease. The headaches in this case, most probably, being due to the crusts blocking accessory sinus openings, and causing a type of headache known as 'vacuum headache', due to refraction of air in sinuses.

After the third injection there is a perceptible diminution of the characteristic ozena odor and also less secretion in the nose. Patient states that she feels much better in every way. Although only three injections have been given, this case shows immediate response to treatment, and bids fair to be a cure.

CASE II.—E. P., *æt.* fifty-nine, janitress. (Referred by Dr. H. Edward Miller, St. Louis.) Very often during the past fifty years had severe cracking in back of head followed by excruciating headache. All previous treatments gave only temporary relief. Has always fondled dogs and cats.

The fetor contaminated the room. Extreme roominess of the nose was present, and covered with a large thick hard greenish-black crust which was removed with difficulty. This crusting extended over the entire pharynx, larynx and trachea. General health was fair. Wassermann test negative.

*Coccobacillus foetidus ozena* (Perez) found and vaccine made. All local washing and treatments were discontinued.

October 16th, 1914, injected 50,000,000 bacilli subcutaneously.

October 22nd, 1914, injected 100,000,000 bacilli subcutaneously.

October 26th, 1914, injected 150,000,000 bacilli subcutaneously.

November 2nd, 1914, fetor almost disappeared. Patient can perceive odors again; a few scattered crusts which are easily removable remain, and the membrane looks reddened and moist. Very little local or general reaction resulted. Injected 300,000,000 bacilli.

November 19th, 1914, a trace of fetor is present, large crusts again appearing. Injection caused only a slight local and general reaction. Injected 600,000,000 bacilli.

November 16th, 1914, large crust in the left nose is present, fetor bad, Slight reaction. Weekly injections were continued and twice severe general reaction with chills and fever followed.

July 24th, 1915, the last injection was given. All crusts, fetor and pain have disappeared and patient has discontinued washing her nose for the past month. Patient reports feeling greatly improved.

CASE III.—A. P. F., male, *æt.* thirty-seven. (Referred by Dr. H. Edward



Miller, St. Louis.) Consulted me November 11th, 1914, with a typical atrophic rhinitis. Patient said he always had a nasal catarrh and persistently used a nasal douche. His sense of smell almost gone. His wife could detect an odor to his entire body when wash was not used regularly. He feels languid and appetite is poor. Has never fondled animals. No history of lues.

A disagreeable stench comes from patient, nasal fossæ unduly wide, the surface of the septum and outer walls covered with an intensely fetid yellowish green mucopurulent crusty discharge. After removing the crusts, the membrane looked thin and pale, the inferior turbinates were shriveled, the middle turbinates about normal but covered with a dry, tenacious secretion. Pharynx and larynx dry and pale. The crusts and discharge were sent to Dr. Klenk who made the following report: Perez bacilli 375,000,000; pneumococci 200,000,000.

Autogenous vaccine was prepared and 1/15 c.cm. injected. The subsequent weekly injections were given in increasing doses. Nasal douching was continued during the injection period. The injections caused considerable local reaction and some general disturbance. After the third injection the patient feels as if he has a bad cold. Three batches of vaccine were made and injected, resulting in a slight improvement of his general condition, although the trophic condition has improved but little.

Dr. Klenk reports inability to get agglutination in this case.

CASE IV.—F., female, *æt.* fifty-five, married. (Referred by Dr. H. Edward Miller, St. Louis.) First seen February 15th, 1915. Complained of a dry nose for many years with continued crusting, Wassermann reaction negative.

Fourteen weekly injections were given and all signs of crusting, odor and nasal discharge ceased. Patient reports feeling perfectly well.

CASE V.—R., male, *æt.* fifty, married, teacher. (Referred by Dr. H. Edward Miller, St. Louis.) First seen July 7th, 1914. Complained of hoarseness and a nasty discharge from the nose.

Examination revealed a pansinusitis with an atrophy. The odor was very disagreeable and small crusts present. Fourteen subcutaneous injections were given and patient improved rapidly.

CASE VI.—M., male, *æt.* twenty-nine, married. (Referred by Dr. H. Edward Miller, St. Louis.) Called to see me the first time on July 24th, 1915. Complained of hacking cough and a fullness in throat for some time, fearing a tubercular infection.

Examination revealed a pungent odor, crusting of the entire nose, nasopharynx, larynx and trachea. Wassermann reaction negative. Marked improvement with a coryza-like swelling, and discharge was noted after the first injection. The cough was much better. After three injections the pharyngitis sicca disappeared, fetor better and crusting very much diminished. Thus far 8 injections have been given with the fetor almost entirely gone, very little crusting, pharynx moist and cough disappeared. Patient never felt better in his life.

CASE VII.—S., *æt.* twenty-six, single, furniture salesman. (Referred by Dr. Greenfield Sluder, St. Louis.) Had nose condition since childhood. Diagnosis made about five years ago, accessory sinus involvement with severe headaches, at times; odor typical and offensive at times. All form of treatment gave no results whatever. Wassermann reaction negative.

Autogenous vaccine prepared February 24th, 1915. First injection, March 3rd, 1915; no reaction; second injection, twenty-four hours later, March 4th, 1915 with a slight reaction; third injection, March 11th, marked local reaction, slight serous discharge from nose, and mild symptoms of choryza. Discharge quite marked after six days; fourth injection, March 18th. Local reaction,

slight fever, nasal discharge not so profuse. Injections given at intervals of one week. Odor markedly diminished after sixth injection, not noticeable after tenth.

Second lot of vaccine prepared. Injections given weekly. Patient apparently well; no discomfort, no odor or discharge. Very slight crusting.

CASE VIII.—N., *æ.t.* forty-nine, housewife. (Referred by Dr. Greenfield Sluder, St. Louis.) Had nasal condition with severe, almost unbearable headaches for ten to fifteen years. Patient claims that she suffered with headache almost constantly for that length of time, with perhaps half a day of relief. Under treatment of various doctors for all sorts of conditions.

Diagnosis made June 14th, 1915. Large nasal cavities, extreme atrophy, nasty odor, greenish purulent discharge, large semisolid crusts. Wassermann reaction negative.

Autogenous vaccine prepared. Injections as follow: First, no reaction; second, slight local reaction; third, marked local reaction, some fever, terrific headache; fourth, local reaction not marked, slight fever, nasal discharge serous in character. No headache. Headache disappeared second day after fourth injection. Patient five days without headache. (Says this is the longest time she has ever gone without headache.); fifth, says that her nose feels as if it would come off; has a so-called feeling of loosening up; sixth, seventh, eighth, ninth, tenth, eleventh and twelfth, slight local reaction, no fever, no headache for eight weeks. Patient felt so good that she decided to discontinue treatment against our advice. Returned in three weeks with a headache, but no other symptoms. Injections were continued weekly after her return. Patient feels confident that she is absolutely well and says she never felt better in her life.

CASE IX.—S., female, *æ.t.* twenty-nine, single. (Referred by Dr. Greenfield Sluder, St. Louis.) Had the condition for at least fifteen years. No treatment of any kind did her any good. Has various complications which are not the result of this condition. Wassermann reaction negative.

A lot of 15 tubes were injected with nearly complete disappearance of odor.

A second lot is now being used. This patient, however, has some crusting and a discharge, but no odor. She also complains of the loss of the sense of smell. Otherwise she says she is well. The odor in this case was the main factor, and it was for this symptom she sought medical advice. She receives injections every week.

CASE X.—B., female, *æ.t.* thirty-five, single. (Referred by Dr. W. M. C. Bryan, St. Louis.) Gave history (February, 1915) of persistent foul discharge from nose with crusts.

Examination revealed atrophic changes. Twelve injections of vaccine given with good reactions. Discharge, crusts and odor grew less, and had practically ceased at end of course of treatment. In August there was slight discharge, and slight odor, but not enough to bother patient.

CASE XI.—S. P., female, *æ.t.* twelve. (Referred by Dr. W. M. C. Bryan, St. Louis.) History of continuous foul discharge for two years.

Examination revealed blackish crusts with atrophy of inferior turbinates.

August 16th vaccine treatment began, and to date patient has had 7 injections. There has been a general improvement: less discharge, fewer crusts, much less odor.

CASE XII.—E. H., female, *æ.t.* fourteen. (Referred by Dr. W. M. C. Bryan, St. Louis.) Headaches, nasal discharge with crusts.

Examination revealed atrophy of both inferior turbinates. Treatment with

vaccine began August 16th. To date, 8 injections have been given. General improvement. Odor much less, discharge and crusting slight.

CASE XIII.—H. H., male, *æt.* thirty-three. (Referred by Dr. I. D. Kelley, St. Louis.) Family history negative; personal history unimportant, except for gradual onset of nasal condition covering a period of years before patient was seen by me, October, 1912.

Patient complained of nasal discharge, crusting, dryness in nasal pharynx, and inability to dislodge crusts from same. Had been treated by various specialists in this country and abroad for trophic rhinitis and nasal pharyngitis, with little success, process gradually increasing in intensity.

Examination of the nose and nasopharynx revealed atrophy and crusting, especially in the nasopharynx. During a period of three years treatment consisted of freeing the mucous membrane of crusts, massage, and local applications of glyco-thymoline, Boulton's solution, argyrol douches, etc. Process showed only slight but persistent advancement.

In February, 1915, vaccines were made from nasal crusts by Dr. Klenk. Patient received 14 injections at intervals, with practically no reaction, except for slight chilly sensations and local redness following third, fourth and fifth injections of vaccines. Local condition improved, crusting markedly diminished, and odor lessened.

Examination three months after patient received last injection, having had no treatment during this period. Nose and nasal pharynx still revealed crusting and atrophy, but process still showed signs of improvement.

CASE XIV.—E., male, seen with Dr. Sluder. (Referred by Dr. E. V. Saunders, St. Louis.) Had been treated all summer for hay fever; had a most persistent cough without fever or much expectoration, as far as I can remember. With the first advent of cool weather, bronchorrhea was present, attended by the most distressing asthma and fever. The expectoration was purulent and extremely profuse.

Treatment by autogenous vaccine was instituted as soon as possible, and the relief was prompt and complete. Within fifteen days the purulent expectoration had ceased and the fever left patient. The cough ceased entirely within four weeks, and the patient was sent to Florida for the winter to escape the danger of recurrence. He has remained well, in this climate ever since.

All the physicians concerned in this case were united in attributing speedy recovery to the autogenous vaccine.

CASE XV.—B., physician, came under Dr. Miller's care for a septicemia of the ethmoid, and was about to be operated upon when bronchorrhea developed with a most incessant and distressing cough and septic temperature, rising to 102° F. every afternoon. The stomach refused all nourishment and medicine, and the condition of the patient became alarming, by reason of extreme prostration and incessant coughing.

Sputum sent to Dr. Klenk, who prepared an autogenous vaccine which was administered at intervals of three to five days in doses increased by arithmetical progression.

Within three days after the first dose, improvement set in and continued uninterruptedly, to complete recovery after fourth dose.

The cough ceased entirely after the purulent sputum, early in the treatment had become light and frothy. Eucalyptus, in full doses was administered, as soon as the stomach became tolerant to food and medicine. Temperature perfectly normal a few days after the third dose.

CASE XVI.—M., female, *æt.* seventy-five, married. (Referred by Dr. E. V. Saunders, St. Louis.) Purulent bronchorrhea, with persistent cough and dis-



trressing asthma symptoms and fever. Medicinal treatment of no avail. Began to improve after the first dose of autogenous vaccine; and at the present time after 10 doses, given at six-day intervals, is free of fever, cough and expectoration; in fact, is in her usual health.

CASE XVII.—L., female, *æt.* twenty-eight, single. (Referred by Dr. T. Y. Ayars, St. Louis.) Had asthma for a very long time. Had been in Chicago and St. Louis for several years. The usual remedies gave but little relief. After a slight improvement, she returned to Ohio. She suffered severely and again returned to St. Louis. Appetite poor and had lost some weight; was given several doses of phylacogen P. D. producing a marked reaction with very slight improvement. Condition grew worse.

Vaccine was prepared from the sputum: first injection, March 11th; no reaction; second, March 13th; slight reaction; third, March 15th, with a very severe local reaction.

Fourth, fifth, sixth, seventh, eighth, ninth, tenth, eleventh and twelfth were given at intervals of one week. About  $\frac{2}{3}$  of each dose was given following the severe reaction of third injection. Dose given according to reaction obtained.

Patient steadily improved. The last dose was given May 15th when she was dismissed, and returned to work June 1st, and has been well ever since.

CASE XVIII.—S., female, *æt.* twenty-seven, single, weight 85 lb. (Referred by Dr. T. Y. Ayars, St. Louis.) Had asthma since childhood; been treated for the last five or six years. Adrenalin chloride 1/200 gr. hypodermically gave slight relief. Autogenous vaccine was prepared from the sputum, and the first injection given April 1st, 1915; second given April 8th; third, April 13th; fourth, April 19th. A severe general reaction followed the last injection. This frightened patient somewhat, and additional treatment was refused. She received another injection May 4th and 13th. Patient has since failed to appear.

## SENSORY CHANGES IN DISEASES OF THE NERVOUS SYSTEM.

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By G. WILSE ROBINSON, M. D., of Kansas City, Mo.

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I do not believe that I wander far from the truth when I make the statement that the average physician has less knowledge of the methods of investigation and proper interpretation of symptoms resulting from lesions of the sensory nervous system than of any other evidences of disease. Our knowledge of this subject has been of slow development. It has been gradually increased by the works of Hughlings Jackson, von Frey, Sherrington, Rivers, Thompson, Head and Holmes and many others. As Head says, sensory changes are no touchstone in diagnosis, but must be correlated with other symptoms in the same way in which percussion takes its place amongst the diagnostic procedures in the examination of the chest. In making a diagnosis of a lesion of the nervous system, we must first ascertain the physical signs. The physical signs must be translated into regional diagnosis, and then we should determine the nature of the lesion.

In the presentation of this subject I shall consider the nervous system at five different levels. First, the peripheral nerves; second, the spinal cord; third, the brain stem; fourth, the optic thalamus, and fifth, the cerebral cortex. I shall discuss briefly the anatomy and physiology of the sensory mechanism, and then the classification and methods of investigating the various components of sensation.

The peripheral afferent nerves are divided into superficial and deep. The superficial are those with end-organs within the skin; the deep have their end-organs within muscles, tendons, joints and bones. Head has divided the superficial system into two subsystems—the epicritic and the protopathic.

These three systems—the epicritic, protopathic and deep—constitute the anatomy of the peripheral mechanism of sensation, and they may regenerate and vary in extent independently of one another. Through the activity of the epicritic system we appreciate light touches, such as those of cotton-wool over hairless parts, intermediate degrees of warmth, the size, shape or pointed nature of the stimulating object. The activity of the epicritic system controls and checks the excessive and widespread sensations which appear whenever the protopathic mechanism alone is responsible for the appreciation of the stimulus.

The sensory mechanism of the skin, which is the oldest biologi-

cally, has been called protopathic because its chief function is to warn the organism that noxious influences are acting upon its surface. By its activity it reveals to us not so much the quality of the stimulus but its effect. It reacts to painful stimuli and to the more extreme degrees of heat and cold.

In the regeneration of the superficial nerves after division, the protopathic system becomes active, much in advance of the epicritic or discriminating system. A pinprick on the surface in this condition is less plain but more painful, and the affected area shows the excessive reaction, the widely radiating sensation, and other phenomena characteristic of the activity of this mechanism when uncontrolled by the higher discriminative forms of cutaneous sensation. It is the opinion of Head that this is biologically the oldest mechanism now active in our bodies, and its functions are restored more quickly than those of any other sensory mechanism. Another interesting feature about cutaneous sensibility, which is of much clinical importance, is the fact that the loss of sensibility to prick and to cotton-wool varies independently of one or the other during regeneration. The relative extent of the two forms of sensory loss depends upon the situation of the lesion in the course of the nerves. The nearer the lesion lies to the periphery the more will the loss of sensation to cotton-wool exceed that of the analgesia to prick. Conversely, the nearer the lesion lies to the spinal cord the greater will be the relative loss of sensation to prick, and in lesions of nerve roots it may exceed considerably the extent of the anesthesia to cotton-wool. It is also important that we know that when nerves are but functionally disturbed, the sensations to cotton-wool and prick stimulation return together, whereas, if the nerves be divided, sensation to prick returns many months before the sensation to cotton-wool.

The functions of the deep sensory system rest upon the integrity of the fibres from the joints, tendons and muscles. All the nerves to the superficial structures may be divided without impairing in any way the function of this system. It is through this system we appreciate sensations of pressure touch, pressure pain; the vibrations of a tuning-fork and the posture of our limbs. If the examiner uses pressure in his examination, his pressure evokes both a tactile and painful response, and he may overlook the fact that the skin is insensitive to light touch and prick.

As the afferent fibres enter the spinal cord they are grouped according to the quality of the sensations which they convey, and a lesion of the cord evokes sensory disturbances which differ fundamentally from those produced by affections of the peripheral nerves, even of the posterior roots.

Pain within the cord is pain whether coming from the deep or superficial structures. And all those fibres conveying sensa-



tions of a painful quality cross over soon after entering the cord to the spinothalamic tracts which are situated in the anterolateral aspect of the cord. The fibres conveying sensations of a thermal nature from the periphery take the same course. These sensations, both painful and thermal, then ascend in the cord in secondary fibres, grouped in the contralateral spinothalamic tracts. Unilateral cord lesions cause a loss of the sensation of pain, heat and cold over the contralateral half of the body below the lesion. Very limited lesions may cause a loss of any one of these components of sensation over the same area without affecting either of the other two. Fibres conveying sensations of a tactile quality in the cord are grouped in the contralateral spinothalamic tracts and in the ipsilateral tracts. For this reason unilateral cord lesions do not cause a complete loss of tactile sensibility over either side. All those fibres conveying from the periphery sensations of posture, passive movements, vibration, the compass test, size, shape and form are grouped in the ipsilateral-dorsal tracts. These sensations ascend in fibres of the peripheral level, and do not cross at all in the cord. Unilateral cord lesions will cause a disturbance of all of those components of sensation over the ipsilateral half of the body below the lesion, there being no regrouping of these fibres in the cord, a small lesion cannot cause a disturbance of any one of these components of sensation over the same area without the others being affected. The above-mentioned anatomical and physiological arrangement explains why unilateral cord lesions cause a disturbance of pain and temperature sense over the side of the body opposite from the lesion, and a disturbance of the other components of sensation rather than tactile over the same side of the body on which the lesion is situated.

The spinocerebellar and cerebellospinal tracts have their peripheral and cerebellar connections on the same side as their cord locations. The long delay of the postural and spacial components of sensation in reaching secondary paths enables them to give off afferent impulses into the spinal and cerebellar coordinating mechanism which lies in the same half of the spinal cord. The impulses which pass away in this direction are never destined to enter consciousness directly. They influence coordination, unconscious posture and muscle tone, and, although arising from the same afferent end-organs, they never become the basis of a sensation.

Those impulses ascending in the dorsal tracts become regrouped in the nuclei of the posterior columns and cross to the opposite side of the medulla oblongata in paths of the secondary level. At the lower part of the pons they join the spinothalamic tracts and the sensory fibres of the fifth cranial in the formation of the mesial fillet; thence to the optic thalamus and cortex, to underlie those sensations upon which are based the recognition of posture and spacial discrimination.

Unilateral lesions occurring between the sensory decussation in the medulla and the optic thalamus may result in a complete loss of all the components of sensation on the opposite side below the lesion, or again, very limited lesions may cause no sensory loss or only a disturbance of one or more components of sensation. The vertical level of the lesion must be determined by noticing which cranial nerve nuclei are most affected, and then the other signs must be translated into anatomical terms at this point of the central nervous system.

The fillet conveying various components of sensation terminates in the optic thalamus. All sensory impulses of whatsoever nature or sources in their course to the cerebral cortex are relayed in the external nuclei of the optic thalami. They are then conducted by fibres of the cerebral level in two general directions, those of an affective nature (pain and temperature, etc.), enter deeply into the structure of the thalami before passing to the cortex; all other components of sensation pass away directly by way of thalamo-cortical fibres to the cerebral cortex. At the thalamic level all sensations have crossed over to the opposite side from that on which they were initiated. Symptoms resulting from a thalamic lesion are manifest on the contralateral side from the lesion. These symptoms vary in character according to the location of the lesion. If the thalamus be entirely destroyed or the fibres be interrupted just as they enter the thalamus, the loss of sensation would correspond to that produced by a lesion of the midbrain. These lesions would interrupt the sensory impulses before their regrouping in the thalamus. The sensory impulses may reach the thalamic junction, undergo characteristic regrouping and then be interrupted by lesion. Lesions of the thalami are usually vascular, tend to disturb anatomical areas rather than functional paths, and the characteristic lesion is one which disturbs both the paths which enter and those which leave.

Lesions of this type are characterized by a group of symptoms which have been elaborated by Roussy and erected by him into a thalamic syndrome. These symptoms are as follow:—

1. Transitory hemiplegia.
2. Involuntary movements
3. Disturbance of cutaneous sensibility.
4. Loss of spacial recognition.
5. Spontaneous pains and over-response to disagreeable or painful stimuli.

An analysis of these five groups of symptoms reveals the following: The transitory hemiplegia is obviously caused by disturbance of the internal capsule. The involuntary movements of an athetotic and choreiform type are probably due to disturbance of the functions of the red nucleus through an interruption of the rubrothala-

mic association, the effect of the lesion upon the red nucleus or upon the rubrospinal tract. The disturbance of cutaneous sensibility, of postural and spacial recognition is due to interference of afferent impulses soon after entering the thalamus or as they pass away to the cortex.

The spontaneous pains and over-response to disagreeable or painful stimuli are due to the essential activity of the gray matter of the thalamus. The thalamus is the center for affective stimuli; normally the cerebral cortex exercises discriminative control through the corticothalamic fibres. When these fibres are disturbed by lesion, the opposite side of the body from the lesion shows an over-response to unpleasant stimuli of which the following are examples: prick, painful pressure, extremes of heat and cold, visceral stimulation, scraping, roughness, vibration and tickling. There is also an over-response to all forms of pleasurable emotions which are appreciated to a greater degree upon the affected side. The cortical center for sensation is in the postrolandic or ascending parietal convolutions and the adjacent parietal regions. The sensory impulses are conveyed to this region by the thalamocortical fibres by way of the internal capsule and sensory radiation. They may be interrupted in any part of their course between the thalami and cortex. There will be no essential difference in the quality of the sensory symptoms from a subcortical lesion and a cortical, but the lower the lesion the greater will be the proportionate loss of sensation.

Pure stationary cortical lesions cause but little, if any, disturbance of sensations of pain, temperature, vibration, or of any other component of sensation of an affective quality. Cotton-wool over hair-clad parts is but little disturbed. These lesions manifest themselves in the sensory realm by more or less gross disturbances of those components of sensation concerned in posture and spacial recognition.

I shall next consider the methods for examining sensation. These methods are based upon the following schedule as outlined by Head:—

(A) Spontaneous Sensations.

Pain, numbness, tingling, position of the limb, idea of the limb.

(B) Loss of Sensation.

1. Touch.

(a) Light touch: cotton-wool on hairless and hair-clad parts, threshold with von Frey's hairs.

(b) Pressure touch: threshold with pressure esthesiometer.

2. Localization: naming the part touched; Henri's method, as modified by Head and Holmes.



3. Roughness: threshold with Graham-Brown's esthesiometer. Sandpaper tests: discrimination of relative roughness.
4. Tickling and scraping: tickling on soles and palms. Cotton-wool rubbed over hair-clad parts. Light scraping with the finger nails.
5. Vibration: loss or diminution of sensibility: alteration in the character of the sensation evoked.
6. Compasses: Points simultaneously applied, points successively applied.
7. Pain.
  - (a) Superficial pain, pinprick threshold with the algometer, reaction to measured painful stimuli.
  - (b) Pressure pain: threshold with the algometer, reaction to painful pressure.
8. Temperature: threshold for heat and cold, effect on adaption to threshold, discrimination of different degrees of heat and cold, affective reactions: (a) to extreme degrees, (b) to warmth.
9. Position: by imitating with the sound limb the position of the affected limb, by pointing with the sound limb, measurement of the defect by Horsley's method.
10. Passive movement: appreciation of movement, recognition of the direction of movement, measurement of the angle of the smallest movement which can be appreciated, falling away of the unsupported limb when the eyes are closed.
11. Active movement: imitation of movement by the sound limb, ability to touch a known spot, measurement of the defect by Horsley's method.
12. Weight.
  - (a) With hand supported: recognition of differences in weight applied successively to one hand, appreciation of increase or decrease of weight, comparison of two weights placed one in each hand.
  - (b) With hand unsupported: comparison of two weights placed one in each hand, recognition of differences in weights applied successively to one hand.
13. Size: difference threshold, distinction of the head from the point of a pin.
14. Shape. (Two dimensions.)
15. Form. (Three dimensions.) Recognition of common objects by their form.
16. Texture.

17. Dominoes. Ability to count points by touch.
18. Consistence.
19. Testicular sensibility: light pressure, painful pressure.
20. Sensibility of the glans penis to measured prick.

In the use of instruments which give measured stimuli we cannot adopt an absolute standard, but the best results are obtained in those cases in which one side of the patient is normal. They are of value in double lesions, but the results are not so accurate. In making our investigations it is not necessary to establish a true threshold, but we should make our observations of the normal side with tests just above the threshold value, but well within the patient's capacity. The abnormal side is then examined by the same tests, and if a perfect set of answers cannot be obtained, the stimulus is increased until the threshold is reached, or if this is not obtainable, until the stimulus is many times greater than that of the normal side; thus all our measurements are comparative and each case yields its own standard. In comparing the reaction to pain evoked over the normal and affected parts, it is necessary that the stimuli be accurately measured, otherwise it is impossible to determine whether or not the force behind the needle is approximately the same with every stimulation. In making a sensory examination, it is necessary that you have the good will and interest of the patient, for without this it cannot be hoped that the observations will be trustworthy. When the attention begins to flag, and the patient loses interest, the examination should be interrupted. It is also advisable that the examiner avoid, as far as possible, anything which might suggest or confuse the response. Each examination should be explained to the patient, and have him make his replies without further questions or suggestions on the part of the examiner.

*Spontaneous Sensation.*—Before making any tests, the patient should be asked to note any abnormal sensations which he has experienced, such as pain, numbness and tingling. He should also be asked to describe them, what he means by these various terms. also if any of them are present, whether or not they are constant. conditions under which they occur, and whether or not they are influenced by contact, heat or cold. He should also be asked if at any time he is unaware of the posture of his limbs, or if he retains a clear mental picture of them.

*Loss of Sensation and Touch.*—There are various methods of investigating tactile sensibility. Light touch can be examined by touching the skin with a small wisp of cotton-wool, having the patient count or say yes whenever he appreciates the touch. In order accurately to make this examination, certain portions of the skin should be shaved, as the pressure upon the hairs gives a lever-

age and increases stimulation, and contact with the hair also gives a tickling sensation which may be appreciated when the skin is insensitive to cotton-wool stimulation. Von Frey's graduated hairs are used for determining the threshold for light touch. Knowing the area of the hair and the force necessary to bend it, the result is expressed in grm. mm.-1. For the determination of the threshold for pressure touch, a pressure esthesiometer may be used. This instrument is weighted with 2 grm. as a minimum, and this weight may be increased up to 50 grm. or more if necessary. The minimum pressure of this instrument can easily be appreciated on the normal side.

*Localization.*—In determining whether or not the patient can locate the spot touched, I consider Henri's method, as modified by Head and Holmes, as the best. Place a piece of cardboard in front of the patient's face. Then place the hand of the assistant which corresponds to the affected hand of the patient on top of the cardboard. As the operator touches the patient's affected hand, which is beneath the cardboard, have the patient touch what he believes to be the corresponding spot on the hand of the assistant with the index of his normal hand. The operator then marks the spot touched by him and on the diagram of the hand which he has before him.

*Roughness.*—The threshold for the appreciation of roughness can be determined by the Graham-Brown esthesiometer. This consists of a mass of polished brass, from which a tooth may be projected by graduated screws. By drawing this instrument over the surface to be tested, and projecting the tooth after each application, and observing when the patient appreciates a roughness, the threshold can be determined. Sandpaper of different degrees of roughness may also be used to determine the patient's ability to appreciate roughness.

*Tickling and Scraping.*—Tickling is an affective stimulus and may be either pleasant or unpleasant, and in cases where there is an exaggerated response to affective stimuli, may be intensely unpleasant.

*Vibration.*—For testing the vibratory sense we use a tuning-fork beating 128 vibrations per second. While the fork is strongly vibrating, set it on some part of the affected surface. If the vibrations are appreciated, continue it on the affected surface until vibrations are no longer appreciated, then quickly transfer it to the corresponding normal surface and ascertain the number of seconds which the vibrations are appreciated over the normal surface after being no longer appreciated over the affected surface.

*Compasses.*—In making the compass test the ability of the patient to appreciate two simultaneous contacts on the normal side is determined first, by making ten single and ten double contacts in



irregular order. The points of the compass are placed just wide enough apart so that the patient constantly appreciates the two points. The affected side is then examined in the same manner and the results compared. Tactile sensibility may be so grossly impaired over the affected areas that no compass test can be made.

*Pain.*—For the purpose of testing superficial pain a pin with a steel point may be used. The normal and affected area should be pricked in quick succession and the patient asked to determine the relative sensations appreciated. The best methods of determining the line of demarcation between the normal and the affected area is by drawing a sharp-pointed instrument lightly over the skin and asking the patient to say promptly when the sensation changes from sharp to dull, or dull to sharp. There are two instruments by which we can obtain the superficial pain threshold. One is the pressure aesthesiometer with the disc removed, giving a sharp point to which we can apply different weights, another is the prick-algesimeter. With this instrument, by means of a graduated spring, we can apply pressure ranging from 2 to 10 grm. to the needle. The sharp point of the needle can be appreciated as pain over normal areas when applied with a pressure of 2 grm. Pressure pain can be measured by Cattell's algometer. This instrument is graduated in kilograms, and with it we can measure the pressure needed to evoke a painful response.

*Temperature.*—For the purpose of examining thermal sensibility, either silver or glass test-tubes may be used. We should first determine the threshold for heat and cold upon the two sides, then the power of distinguishing the relative warmth or relative coldness of the two tubes and the results obtained on the sides compared. We should then determine the effect upon the two sides of extremes of temperature.

*Position.*—For the purpose of testing the patient's appreciation of posture, we place a limb or segment of a limb in a certain position and ask the patient to describe the position or indicate with the normal limb the position of the affected limb, or we ask the patient to touch with the index finger of the normal hand the index of the affected hand or the great toe of the affected foot, with the eyes closed. If we desire to measure a defect we can use Horsley's method or Horsley's method as modified by Head and Holmes, which is as follows: Place a piece of cardboard with a depression in the center at the umbilical level, place the index of the affected hand in the depression beneath the cardboard. Have the patient, with eyes closed, touch upon the top of the cardboard the point which he believes is just above the index of the affected hand. Have him do so several times, measuring each time the distance of the point which he touches from the point above the affected index, and then note the average.

*Passive Movement.*—The patient's ability to appreciate passive movement may be determined by changing the position of a segment of a limb and asking him to indicate when he can appreciate movement. This defect may be measured by an instrument devised by Holmes. It consists of a piece of brass which can be strapped to any part of the limb. At one end of the plate is an arm which carries the arc of a circle. Two arcs are used, one with a radius of  $7\frac{1}{2}$  cm. for measuring movements of the fingers, and another with a radius of 15 cm. for longer segments. The arm carrying the arc lies immediately over the point at which movement is to be measured. The arc is then brought into the plane of the movement that is to be made. The range of movement necessary for appreciation can then be easily read off the scale on the arc.

*Appreciation of Weight.*—For the purpose of testing the appreciation of weight, lead discs lined with chamois skin and ranging in weight from 20 to 120 grm. are used. This test should be applied with the hands supported and unsupported. To the supported hand two weights are applied successively and the patient is asked to determine which is the heavier. Two weights are found which can be correctly distinguished in the normal hand and they are then used to test the affected hand in the same way. By a series of tests with different weights a threshold difference may be established for the abnormal hand, and it is then compared with the threshold difference of the normal hand. Patient is also asked to compare two weights placed one on each fully supported hand. In testing the appreciation of weight in the unsupported hands, a weight is placed one in each hand, and the patient is asked to weigh them by raising and lowering the hands.

*Appreciation of Size.*—This may be tested by placing articles of different size successively in the patient's hands and asking him to tell the difference. For this purpose circular discs of thick leather are used increasing by  $\frac{1}{2}$  cm. from 1 cm. to 4 cm. in diameter and 4 to 5 mm. in thickness. As the difference threshold is small in the palms, it is here we get our best results in testing appreciation of size.

*Appreciation of Shape.*—For the purpose of testing appreciation of shape we use a circle, a square, triangle and oblong cut out of stiff leather.

*Form in Three Dimensions.*—For testing the patient's appreciation in three dimensional shapes any ordinary object may be used, but the most convenient are the standard tests of the geometrical forms, such as a cube, a cone, an ellipse, a pyramid and a cylinder made in approximately the same bulk of wood.

We should also test the patient's ability to recognize familiar objects when placed in the hands with the eyes closed.

*Appreciation of Texture.*—For this test, a set of common ma-

terials may be used, such as calico, flannel, silk, cloth and velvet. The patient is asked to feel them and identify them.

In some cases of cortical lesion it is advisable to use dominees made for the blind with raised pips. The patient is asked to place his fingers over the pips and count them.

*Appreciation of Consistence.*—For testing a patient's ability to recognize consistence or relative hardness, pieces of rubber tubing of the same diameter but with walls of different thickness are used. The patient is asked to compress two in succession between his forefinger and thumb. This is done with the normal and affected hands, and the results compared.

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## SOME OBSERVATIONS ON AORTIC ANEURYSM.

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The diagnosis of aortic aneurysm is always pregnant with interest. There are few lesions that present a more diverse clinical picture than this protean anomaly. No two cases are alike and there are no two signs common to all. Although in not a few a correct conclusion is easy to reach, in a considerable proportion of cases an exhaustive study and a careful analysis are essentially in order to arrive at a successful interpretation of the findings.

It is well to remember that an aneurysm may remain latent and give no signs of its presence until rupture, when necropsy reveals the true condition. Not long ago a young married woman suddenly died in this city, shortly after eating a delicacy brought to her by a woman with whom her husband had been closely intimate before marriage. There had been evidence of jealousy existing between them. In view of these suspicious circumstances the coroner ordered a necropsy. A ruptured thoracic aneurysm was found. No previous evidence of its existence had been noted by her family physician.

A similar experience, which occurred in the practice of a colleague, was that of a married man, father of several children, in apparent good health, who while indulging in illicit sexual intercourse in a house of ill-fame, suddenly expired. Foul play was naturally suspected, and the woman held pending the result of the coroner's investigation. Necropsy revealed a small aneurysm that had ruptured into the pericardium. The severe strain brought about by this undue physical exertion precipitated the rupture of the weakened aneurysmal wall.

Many like cases are on record where individuals apparently in robust health suddenly die while in the performance of their accustomed occupation. Even while asleep rupture has occurred, and a wife has awakened in the morning and found her husband dead beside her. The condition is not rare and there are probably not a few practitioners who have had such occurrences in their practice.

The majority of these latent aneurysms which terminate in sudden death are of the small, thin-walled type situated at or near the valsalvian sinuses. It is conceivable that small ectasias, even more distal to the heart in the thorax and in some situations

along the abdominal portions of the vessel, may for a time fail to show evidence of their presence, but when we consider the intimate anatomical association of so many vital structures throughout the whole extent of the aorta, it seems hardly probable that a large aneurysm could long remain latent. All symptoms of this lesion being those attributable to pressure, an extensive dilatation would be sure to involve the contiguous parts.

The symptoms of all aortic aneurysms, being due to pressure or irritation of the surrounding elements, would depend upon their location and the proximity to other structures, and be directly referable to the organ or tissue affected. Keeping these facts in mind it is easy to comprehend the multiplicity of symptoms; and with a knowledge of the variable character of the physical signs,—it being pointed out by Dr. W. T. Gairdner,\* of Glasgow, that there is no lesion of the chest which aneurysm may not simulate; to which might be added that there are not a few diseases of the abdomen for which it may be mistaken, hence we get an idea of the confusing symptom-complex that may possibly be presented for diagnosis.

It is not within the scope of this paper to consider all the clinical manifestations of aneurysm of this vessel. The task would be endless and of no special profit. It is hoped, however, that by confining ourselves to certain concrete examples of the condition personally observed, it might be of some benefit to others who are confronted with similar diagnostic problems.

This study is based upon a series of 9 cases coming under observation at the Roper Hospital, in the service of Dr. Robert Wilson, Jr., and in private practice during the past four years. Of the 9 cases, 8 were negroes. Those of the eight classed as negroes had white blood in their veins. There were eight males and one female, the latter being a negro. Eight cases involved the thoracic and one the abdominal portion of the vessel. Except in one of the cases (Case II), the lesion was fairly well advanced when first coming under observation. In one other (Case I), only symptoms were present. In all the others physical signs of more or less value existed.

CASE I.—W. W., mulatto, *æt.* forty-seven, was sent up to the ward from the out-patient department of the hospital with the diagnosis of diabetes mellitus. His chief complaints were weakness, persistent cough and moderate dyspnea, both of which latter were much aggravated on lying down at night, interfering with sleep. The lungs and heart were clear except for a somewhat accentuated aortic second sound. Sugar was present in the urine continuously. Acidosis was at first suspected as being the cause of the lung manifestation, but there was no acetonuria. A roentgenogram was made which showed an aneurysm of the thoracic aorta. The glycosuria remains unexplained, as the patient left the hospital before a complete study could be made.

\*The Early Symptoms of Aneurysm of the Aorta as Anticipating Physical Diagnosis. (International Clinics, Vol. IV, Third Series.)

CASE II.—A. C., mulatto, *æt.* forty; first seen five years ago, when his most urgent ailment was asthma. He had a more or less constant cough of variable severity, but was able to follow his trade, that of barber, except at the times when paroxysmal attacks would occur. It was in one of these attacks that he was brought to the hospital where the diagnosis of bronchial asthma was made. A year later he returned with a loud metallic cough and dyspnea. The latter was more or less constantly present, but still maintained a certain periodicity of heightened difficulty. The cough was more severe in the morning, and large quantities of putrid sputum would be brought up. There was a daily evening rise of temperature. Musical râles were heard all over the chest, but posteriorly bubbling râles were also present.

There were no areas of consolidation. Tubercle bacilli were constantly absent from the sputum. The diagnosis of bronchiectasis was made, no cause therefor being assigned. The patient left the hospital perhaps slightly improved from the rest in bed, to come back about one year later. About the same condition was present except that there was a slight area of dulness below the clavicle about one-half inch to the right of the sternum. We then awakened to the true condition and had a roentgenogram made, which revealed an aneurysm of the aorta, pointing outwardly and to the right.

I have been watching this patient for the past two years and noting the advent of new phenomena. The area of dulness below the clavicle has increased considerably, the pulsation at the right sternoclavicular articulation becomes more and more marked, probably eroding these two bones and the ribs, as the sac appeared fairly superficial and had an expansile character. The tracheal tug developed. He died a few days ago from gradual cardiac dilatations, asthenia and morphinism.

CASE III.—W. T., also a mulatto, *æt.* forty-five, was admitted to the hospital suffering with cough, dyspnea, expectoration, edema of feet and insomnia. There was evidence of cardiac hypertrophy, a systolic murmur over aortic area transmitted to neck, and a diastolic murmur over same location transmitted down the sternum. There was also a systolic murmur at apex transmitted to axilla. A distinct systolic thrill was felt over right base of heart and up right side of neck. There was impaired resonance over upper sternum. A slight but perceptible difference in volume of the pulse at the radials was noted. Oliver's sign (tracheal tug) also present. The diagnosis of thoracic aneurysm with relative dilatation of the aortic ring was made, which roentgenogram and subsequent necropsy confirmed.

CASE IV.—W. F., negro, *æt.* forty, complained of cough, dyspnea, edema of feet and precordial distress, presenting all the usual signs of decompensating heart. There was a diastolic murmur at the pulmonic area, and vehement cardiac pulsations over whole precordium, being fairly distinct even as high up as the second left interspace. The cardiac dulness was extensively increased downward and to the left. No tracheal tug present. These signs in conjunction with the foregoing symptoms led to the diagnosis of aortic incompetency with cardiac dilatation. The pulsations at the base were explained as 'dynamic,' and the point of maximum intensity, the pulmonic area, looked upon as unique but of no diagnostic importance. Not being entirely satisfied, we had a roentgenogram made which showed an extensive dilatation of the aorta. Later the case came to necropsy and an enormous aneurysm, larger than the double fist, was found, involving the whole extent of the arch, causing a relative dilatation of the aortic ring. The entire heart was hypertrophied and dilated.

CASE V.—S. B., negro, female, *æt.* forty-one, entered hospital with dyspnea, hoarseness, cough, pain in throat and edema of dependent parts. There was a



double murmur heard loudest at the aortic area and also at the apex. Cardiac dulness increased downward and to the left. Corrigan pulse. No tracheal tug. The diagnosis of aortic aneurysm was confirmed by the fluoroscope.

CASE VI.—W. S., negro, *æt.* fifty, had dyspnea, cough, expectoration of bloody froth, and edema of ascending type. There was a systolic murmur at aortic area and marked pulsation of sternoclavicular articulation. Roentgenogram showed aneurysm of arch.

CASE VII.—B. M., negro, male, *æt.* forty-one. Complained chiefly of cough, of ringing, metallic type and dyspnea. Considerable abdominal pulsation was noted at the base, and the heart hypertrophied. There was a distinct retardation and weakening of right radial pulse. Fluoroscope showed a large pulsating tumor of aorta.

CASE VIII.—B. R., negro, *æt.* forty-five, presented a most perplexing symptomcomplex. It was one of those instances 'where all signs fail.' He entered the hospital with a history of cough, pain in left side of chest, and fever at night. Apparently it came on insidiously, but he dated his illness two months previous to his coming under observation. On admission he was suffering with dyspnea, cough, expectoration and edema of feet. A systolic, and what at the time seemed to be a presystolic, murmur was heard at the apex, and some rather rough squeaking sounds at the base. The second sounds were both fairly loud and the heart hypertrophied. No tracheal tug present. The patient left the hospital before a complete study was possible. The diagnosis recorded at this time was mitral insufficiency and stenosis, and possibly pericarditis. He returned six or eight weeks later. Dyspnea and cough much aggravated; no edema of feet; daily evening rise of temperature one or two degrees. No tubercle bacilli in sputum. The physical examination showed the same systolic murmur and loud second sounds. The indefinite presystolic murmur was probably a friction sound and was so decided. Rough, loud râles were heard over whole precordium, but best over base at right of sternum. They did not occupy any definite period of the cardiac cycle and were louder during expiration. A short thrill was present when the thorax was empty. There were distinct signs of fluid in left chest and pleural friction râles in right axilla. Aspiration of right side showed bloody transudate. Calmette's tuberculin test negative. Wassermann test positive; total leucocytes, 16,250; polynuclears, 77.5; other cells fairly normal. Slight anemia. Fluoroscopic examination was reported negative for aneurysm by roentgenologist, but large heart shadow and fluid in right chest. The fluid in the left pleural cavity had disappeared between the time of aspiration and time of roentgen examination and had accumulated on opposite side. The diagnosis of polyserositis of probably tubercular origin was tentatively made. One observer suggested aneurysm. Necropsy revealed a syphilitic aortitis with saccular aneurysm, the size of a double fist of lower thoracic aorta (that portion just above the diaphragm, eroding lower five thoracic vertebræ). The sac was firmly connected with the lung, pericardium and diaphragm. It was filled with solidified clot. The adhesions also involved spleen and liver, forming a dense sac containing the lung, pericardium, liver and spleen. There was hypertrophy of the right heart with parenchymatous degeneration and acute dilatation. There was fibrosis of the lungs, and the posterior part of the left lung was collapsed. Bronchiectasis and chronic bronchitis also present.

It is probable that the situation of the aneurysm just behind the heart and mass of adhesions binding so many dense structures together, made it impossible for it to show up on the fluoroscopic screen.

The apical murmur was probably due to relative insufficiency of mitral ori-

fice. The friction sounds were not merely pericardial rubs, for this was firmly adherent to the heart and aneurysm; they were probably produced by friction of the heart against the aneurysmal sac.

CASE IX.—Male, white, *æt.* forty-three, railroad conductor. His chief symptom was pain of the most severe and agonizing character, occurring paroxysmally and referred to the right side of the abdomen, more especially to the right lower quadrant. Vomiting usually occurred during the attacks. From a powerful, well-nourished man of 200 lb. he had fallen off to about 140 lb., and had become quite thin for one of his stature during the three or four years that his illness lasted. He sought relief from one physician after another, and had almost as many opinions of his condition expressed as doctors consulted. During the course of his rambles he lost an unoffending appendix, had his gall-bladder explored for stones, and his kidney incised for renal calculus. After each operation, especially during his stay in the hospital, the symptoms would ameliorate and he would begin to feel that the cause of his trouble had at last been removed. But after his return home it would not be long before the paroxysms would again recur with their old-time ferocity. His only solace was morphine.

The physical examination revealed a fairly distinct tumor midway between xiphoid and umbilicus. It could not be grasped with one hand, but could be more or less definitely outlined with the fingers of both. A slight systolic thrill was palpable, and the pulsation was expansile in character. A rather loud systolic murmur was noted on auscultation. The diagnosis of aneurysm of the abdominal aorta was made.

The patient subsequently left Charleston for a nearby city, where, in spite of advice to the contrary, he submitted to an exploratory laparotomy, at which this opinion was confirmed. He recovered from the operation, but has since died.

In this series there were two symptoms constantly present in the thoracic cases—namely, difficult breathing and cough. These evidences of aneurysm are the most common and are perhaps always present during some stage of the disease. It might be remarked, however, that these two symptoms are present in almost every lesion of the thorax. They are, therefore, in no way diagnostic, but are helpful in concentrating our efforts to this region.

It is interesting to consider for a moment the causes of dyspnea and cough in aneurysm. Recalling that the aorta lies for the most part in the mediastinum, surrounded by the heart, lungs, bronchi, pleuræ, pericardium, in close proximity to the trachea, esophagus and large veins of the thorax, and, most interesting of all, in direct touch with the important nerves of the chest, recurrent laryngeal, vagus, phrenic and cervical sympathetic, it is readily seen that a dilatation of this great vessel would encroach upon the rights of its neighbors and cause them to respond in their characteristic manner. In the case of dyspnea and cough many factors may be active in producing them: by mechanically occluding the bronchi, causing bronchitis and bronchiectasis; by pressing upon the lungs and pleuræ; by irritating the recurrent laryngeal nerve, giving rise to metallic cough, and the vagus, causing the

paroxysmal type of dyspnea, or the phrenic, affecting the contraction of the diaphragm, and again by secondarily affecting the heart, causing chronic dilatation. It might obstruct the free flow of blood in the thoracic veins, causing effusion into the pleuræ, which would give the symptoms.

In the cases here cited it is difficult to place the blame upon any one phase of aneurysmal pressure effects. There were probably many acting in every instance. In a few it would seem that one or two certain factors were paramount. In Case I, for instance, with only cough and dyspnea, irritation of the recurrent laryngeal, and perhaps pressure on the larger bronchi on lying down, were responsible.

In Case II irritation of the pneumogastric probably caused the paroxysmal type of breathing, although the large quantity of sputum undoubtedly pointed to bronchial pressure.

In all the cases there was a bronchitis present and in nearly all a bronchiectasis. I would emphasize here that one should never be satisfied with a diagnosis of either of these conditions. Remember that they are always secondary, and the cause should be diligently sought. It was suggested in the foregoing that dyspnea and cough would direct our attention to the chest. This is very true, but it should be borne in mind that renal disease is one of the most prolific sources of these conditions and must be eliminated.

A number of the chest aneurysms presented symptoms of broken compensation. Three of them appeared, from the physical examination, to have aortic incompetency. As a matter of fact they did, but had we been satisfied to stop here our diagnosis would have been far from correct. We would have missed the primary condition. The aortic leak in each of these cases was relative, that is, due to a dilated ring. In two of these cases there was a double murmur, systolic and diastolic at the aortic cartilage. Stenosis and insufficiency are frequently associated; in fact, it is rare when either is pure, but we are readily led to conclude that they are present when the heart is hypertrophied and there are symptoms of decompensation.

Such cases always offer the possibility of aneurysm, and we never make the diagnosis of the combined aortic lesions in the wards of the Roper Hospital until we have received a negative report from the roentgenologist.

Fever was present in a few cases of this series, in which bronchiectasis was demonstrable. This was probably due to infection of the bronchial accumulations. The continued evening rise, in Case VIII especially, was suggestive of pulmonary tuberculosis and was partly responsible for the mistaken diagnosis. Osler has spoken of such cases as 'aneurysmal phthisis.'

Before closing I would call attention to the significance of pain



—the one great symptom of abdominal aneurysm. The aorta in that portion of its descent lies to the left centre of the abdomen, and is bounded posteriorly by the vertebral column, and is surrounded anteriorly and laterally by a veritable meshwork of finely interwoven nerve fibres, filaments from which supply every viscus in the cavity. Irritation of these sympathetic plexuses would give pain, the same being referred to the structures supplied. The pain, as is more or less characteristic of all nerve involvement, is intense and paroxysmal in character. It is quite often referred to the right side because of the fact that aneurysm is most common at the cœliac axis and it is from here, I believe, that this side is innervated. The other type of pain in aneurysm in this situation is of a dull constant boring character and is present when erosion of the vertebra is in progress.

In treating cases in which chronic abdominal pain is the leading symptom, especially if it is severe and intermittent, and there is no muscular rigidity or constitutional reaction, we should at least think of the possibility of aneurysm even if further study leads to some other conclusion.

459 Meeting St.

THE DIFFERENTIAL LEUCOCYTE COUNT AS AN AID IN  
THE RECOGNITION OF SOME OF THE DIS-  
EASES OF CHILDHOOD.\*

By CARL G. LEO-WOLF, M. D., of Buffalo, N. Y.

Rather than greeting you with the usual generalities with which you are surfeited at occasions like the present one, I have deemed it preferable to give you something, which though not new, still might be worth a few minutes of your attention.

I have made a comparatively short compilation of the facts which we can learn by making a differential leucocyte count in some of the diseases of childhood; facts which, as I hope to be able to show you, may frequently be of great help to us, not only in arriving at a correct diagnosis, but which also will in many a case give us a better idea of the prognosis.

Whilst I have gleaned these notes from the works of different authors, I have verified them to a large extent by personal investigation, and I may state right here that these examinations have proved to be of inestimable value to me.

Let us first glance at the differential leucocyte count in the normal child.

At birth the percentage of the polynuclear neutrophiles is rather high; during the first twenty-four hours of extra-uterine life their ratio rises to seventy or even more per cent. of the total leucocytes and they will then, during the next seven to ten days, drop to the normal relation, as we shall later find it during the whole of infancy, when we find the following averages:—

Small mononuclears. . . . .	40 to 50 per cent.
Large mononuclears and transitional. . .	10 per cent.
Polynuclear neutrophiles. . . . .	35 to 45 per cent.
Eosinophiles. . . . .	1 to 5 per cent.
Mast cells. . . . .	1 per cent.

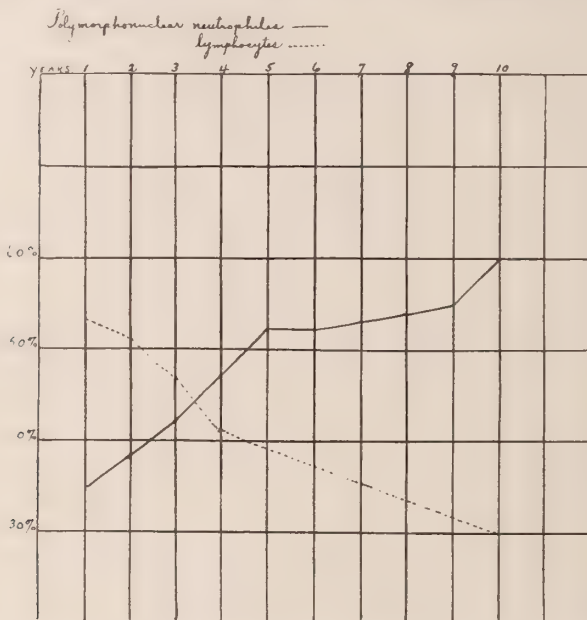
Myelocytes are normally not present in the blood, but they appear upon slight provocation, so that 5 to 6 per cent. of these is nothing unusual.

The principal point to remember when we make use of the differential leucocyte count in young children is this, that the proportion of the polynuclear neutrophiles increases and that of the

\*Presidential Address read before the Meeting of the Eighth District Branch of the Medical Society of the State of New York, held at Olean, September 21st and 22nd, 1915.

lymphocytes decreases with every year until when the child reaches the age of ten the blood-picture closely approaches that of adult life. This change in the ratio of the polynuclears and the lymphocytes I have brought out in the accompanying chart.

Let us now pass in review the different diseases most frequent



in infancy and childhood and let us see what peculiarities as to the differential leucocyte count we can observe.

In *measles* we will find a marked hyperleucocytosis during the stage of incubation, the pre-eruptive stage, the polynuclears being then markedly increased in number. During the eruptive stage we will find a leucopenia with a relative lymphocytosis. The eosinophiles are also decreased early in the attack and increased later. If examination of the blood during the exanthematic stage of measles or during convalescence should reveal a leucocytosis, this should always put us on our guard and make us look out for complications, such as a bronchopneumonia or a septic infection, especially of the middle ear.

In *scarlet fever* we will observe between the second and eighth day of the disease a very marked leucocytosis, from 18,000 to 40,000; the polynuclear neutrophils are relatively as well as absolutely increased and their number rapidly decreases as the fever and toxemia subside. The mononuclear lymphocytes are relatively and absolutely increased in the later stages of the disease as are also the eosinophiles. The leucocytosis subsides in uncomplicated cases during the second or third week of illness. In this disease, the same as in measles, a prolonged leucocytosis will indicate a



complication, usually of a septic nature, and the leucocyte count will thus not only help us in the diagnosis, but will also have considerable importance in forming our prognosis.

In *rubella* we will meet a polynuclear leucocytosis during the stage of incubation and a leucopenia during the exanthematic stage.

In *varicella* a moderate leucocytosis, mainly an increase in the polynuclears, is observed during the pustular stage.

In *variola* we find a marked leucocytosis, especially during the vesicular stage; the lymphocytes are increased in number while the polynuclears are decreased. It can readily be seen how important a rôle the differential leucocyte count will play in cases in which some doubt exists in case it is variola or varicella.

In *diphtheria* the simple anemia is as a rule accompanied by a hyperleucocytosis in which the polynuclears prevail; the leucocyte count may go up to 48,000; myelocytes are also frequently found.

Very interesting is Ewing's report of the action of the injection of diphtheria antitoxin upon the blood-picture. He found that within one-half hour after the injection of the antitoxin, the leucocytes, particularly the polynuclears if they have been previously abundant, will show a marked diminution; the leucocytosis will return after twenty-four hours, though it will rarely reach its previous grade, except in fatal cases.

In *pertussis* we find both during the stage of incubation and the paroxysmal stage a marked leucocytosis of from 20,000 to 40,000, while when all forms are increased we will observe a relative as well as an absolute increase in the number of the lymphocytes.

In *lobar pneumonia* a polynuclear leucocytosis, up to 40,000 or 50,000, can be found from the first day of the disease. Here the leucocyte count is of great prognostic value inasmuch as a high leucocyte count is a favorable sign, whilst a low count presages an unfavorable prognosis.

In *influenza* and the *grippy infections* we find no leucocytosis, or at least only a very slight one. A marked leucocytosis in these infections always indicates either a septic complication or that a latent glandular infection with the tubercle bacillus has been activated.

In *mumps* we will observe a slight lymphocytosis, which will be more pronounced in those cases in which an orchitis occurs.

In *typhoid fever* a leucopenia is found; the leucocytes diminish progressively down to 2,600, and at the same time we observe a relative increase in the mononuclears and a decrease in the polynuclears and the eosinophiles. A leucocytosis will warn us to look for an impending perforation or a complicating septic process.

Of great diagnostic value is the leucocyte count in *effusions in the chest*. In cases of primary serous effusions we will hardly ever

see a leucocytosis, whilst the leucocytosis is usually very marked when the fluid is purulent. If the fluid withdrawn from the pleural cavity should show a large excess of lymphocytes, this will indicate that the case is one of tuberculosis; if the polynuclears should prevail, this would indicate the acute infectious variety of pleurisy.

In *peritonitis* also the leucocyte count is of great diagnostic value, as we see only a slight degree of leucocytosis in tubercular peritonitis, whilst in appendicitis and in septic peritonitis a high degree of leucocytosis is present, except in those cases in which the system is overwhelmed by the toxemia and in which the leucocyte count will reveal the unfavorable prognosis.

Nowhere perhaps is the differential leucocyte count of greater importance than in the *diseases of the nervous system*.

In *cerebral tumor and idiopathic epilepsy* the leucocyte count differs in no way from the normal.

In *poliomyelitis* we observe a leucopenia down to 5,000 or 3,000 in the early stages; later we will find a moderate lymphocytosis with a relative increase in the number of the eosinophiles.

In *epidemic cerebrospinal meningitis* the blood-picture reveals a neutrophile leucocytosis, the polymorphonuclears far outnumbering all other forms. In the spinal fluid in this disease, which is usually turbid and in which on standing a fibrin clot or a sediment of pus will form, from 75 to 90 per cent. of the cells will be polynuclears. In those cases which recover, the percentage of mononuclears gradually increases until they finally exceed the polynuclears in numbers.

In *tubercular meningitis* the spinal fluid usually contains eighty cells in the cubic milimetre, of which from 80 to 98 per cent. are mononuclears.

In *congenital syphilis* we observe a leucopenia with relative lymphocytosis, also a preponderance of myelocytes and eosinophiles.

In *tuberculosis* we also observe a leucopenia, and whenever we find a leucocytosis we may be sure that this is due to a mixed infection.

In *exudative diathesis* we find an increase in the number of the eosinophiles, and therefore, naturally, in the cases of infantile eczema.

The eosinophiles are also increased in cases of *intestinal parasites* and *trichina*.

*Gastro-enteritis* is accompanied by leucopenia, as is also *malaria*.

I have given you, in the foregoing, a short résumé of the differential leucocyte count, which is by no means complete, nor is it, let me repeat here, original.

It has been my personal experience that these kinds of investigations are much better remembered and prove to be more interesting when collected in the space of a short paper, and I trust that I have succeeded in doing so.

FRACTURE OF THE LUMBAR SPINE WITHOUT  
COMPRESSION OF CORD.

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The lumbar spine being movable in every direction, maintaining muscle balance of the entire body, and having the superincumbent weight of the trunk, is obviously more susceptible to injury than other regions. Nature reflexly shields the cervical, while the dorsal is mechanically protected by the lateral attachment of the ribs and the vertical articular processes.

Cotton, Stimpson, Scudder and others call attention to the fact that fracture of the body with displacement and without cord pressure is possible at any level, but must be considered infrequent, as Burwell in 1905 reviews 244 spinal fractures, giving the lowest mortality to the lumbar region as 50 per cent., and of those who recovered, considering the spine as a whole, 37.8 per cent. were hopeless cripples.

In a careful review of the literature of the past five years, I could find no mention of fracture without pressure symptoms. Of course, when such exists following trauma, the diagnosis is apparent, though Painter and Osgood have shown that paralysis may occur from sudden forcible bending without permanent dislocation or fracture. But fracture of the bodies of the lumbar vertebrae without compression of the cord must frequently pass unnoticed, as the trauma may be slight or symptoms referable to the spine overshadowed by severe peripheral injury.

When any material evidence exists of spinal injury, a rigid examination should be made, including skiagram (both anteroposterior and lateral view) which may, I believe, frequently reveal displacement or fracture when least suspected.

Symptoms vary as to the seat of fracture. There may be pain, which is usually referred, as sacroiliac joint, sciatica or even the right lower quadrant of the abdomen, closely simulating appendicitis; muscular spasm may be general, unilateral or irregular. The patient usually complains of weakness, especially inability to lift even light objects. A small kyphosis may indicate the injury, but is by no means diagnostic, as an abnormally long spinous process may present the same appearance. The symptoms increase in neglected cases, and it is possible that callous formation and further deformity may interfere with the canal.



I have recently seen five fractures in the lumbar region which are herein reported:—

CASE I.—B., *æt.* thirty. Railroad fireman. Was first seen April 3rd, 1913. Three months previously fell from his engine while on a bridge, striking a log 30 ft. below. He was carried to a local hospital, where he remained two months, being treated for fracture in region of ankle, no special attention being given spine though he complained of much pain in lower lumbar region and both lower extremities. By the aid of two men and crutches he was able to reach the office. On examination there was deficient muscle force of both lower extremities, but no total paralysis of any group of muscles. Spinal movements partially limited in all directions. A distinct kyphosis marked the point of injury in the dorsolumbar region. Skiagram showed fracture with impaction of the body of the 1st lumbar vertebra (compression fracture).

CASE II.—L. D. P., *æt.* forty-eight, was first seen August 13th, 1914. May 3rd, 1912, he jumped from the top of a falling telephone pole, striking on buttocks. Suffered general muscular pain for several days, being confined to bed for ten days, after which was able to be about and did not think injury severe, though pain persisted in left hip and sacral region. Had several attacks of loss of consciousness when he would fall. (No convulsive movement or biting of tongue.) Has been treated for neurasthenia and hysteria and advised to take rest cure. *Examination.*—Marked limitation of all motion of spine, otherwise symptoms subjective. Skiagram shows fracture of 5th lumbar vertebra.

CASE III.—W. A., *æt.* eleven. Called at office, December 7th, 1914. October 8th, 1914, fell from pecan tree a distance of about 8 ft., striking on buttocks; was stunned several minutes, but went home and continued school for two days; on second day had pain in left lumbar region. On third day had fever which lasted several weeks, during which time had pain in left side and lower portion of abdomen and left hip. Left hip became gradually flexed. *Examination.*—Walks with left hip flexed and hand on knee. Hip cannot be extended below 90 flexion. Abduction slightly limited, flexion and rotation free. Typical psoas contraction. Slight tenderness left side of abdomen, lower quadrant. *Spine.*—Side bending not present to the right, only slight to left. Flexion near normal, extension limited. *Skiagram.*—Lateral displacement with possible fracture of articular processes of 4th lumbar vertebra.

CASE IV.—L., lawyer, *æt.* fifty-four. Was first seen March 10th, 1915. Eight weeks previously fell from roof, striking fence astride 6 ft. below, thence to the ground another 6 ft. Was carried home, where he remained in bed four days, since which has attended to business, making several trips on the train, but suffered constant and increasing pain in right sacro-iliac joint and posterior aspect of hip. On examination, there was tenderness over right sacro-iliac joint. Right thigh could not be flexed with knee extended (Goldthwait's sign). Side bending of spine limited to left and other motions to slight degree. About first lumbar vertebra could be seen very slight knuckle. Skiagram shows impaction (compression fracture) of the body of first lumbar, with obliteration of intervertebral disc.

CASE V.—H., farmer, *æt.* twenty. While walking to station in Jackson, Miss., slipped and fell backward striking spine against curbing, but was able to continue journey to his home in north Mississippi. He walked three days but had great pain in lower lumbar region. On the fourth day became so weak in spine that he could not walk. Was first seen at Baptist Memorial Hospital, March 16th, 1915. There was marked kyphosis in lumbar region with limita-



Fig. 1.—Case I, Mr. B., *æt.* thirty, showing compression fracture of first lumbar vertebra, which was not recognized during three months' treatment for fracture of ankle.



Fig. 2.—Case IV, Mr. L., *æt.* fifty-four, showing compression fracture of first lumbar vertebra, after which patient resumed duties in a few days, not coming for treatment for eight weeks after injury (antero-posterior view).



Fig. 3.—Case IV, side view.



Fig. 4.—Case V, Mr. H., *a/l.* twenty, showing compression fracture of second lumbar vertebra (anteroposterior view).



Fig. 5.—Case V, side view showing more clearly nature and extent of injury, and also the importance of making both views of all spinal affections.



tion of motion in all directions, but no paralysis. Skiagram shows impaction and comminution of body of second lumbar vertebra (compression fracture).

The general plan of treatment in each consisted in head and limb traction (both lower extremities) with gradual hyperextension of the spine until overcorrection or the best possible position could be attained, after which a plaster jacket was applied in extreme hyperextension. A brace replaces the cast. All responded successfully to treatment.

One might naturally suppose that considerable force is necessary to produce fracture of the vertebræ, but that slight trauma may cause destruction is well shown in Case V. In Case I injury of the spine passed unnoticed for three months, while fracture of the leg received careful attention. Case IV walked about for eight weeks, giving every evidence of sacro-iliac strain, which makes it quite conceivable that such symptoms following trauma might often be caused by a higher lesion.

The cord terminates in the conus between the first and second lumbar vertebræ, but paralysis may occur from trauma to the cauda equina. This, however, escapes more often than is commonly known, and I feel sure that if careful examination were made of all spine injuries, including two view skiagrams, more fractures would be discovered in the lumbar region, the mortality rate lowered, and many painful spines and 'sacro-iliac' strains prevented.

Memphis Trust Building.

# MEDICAL AND SURGICAL PROGRESS.

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## THE PRESENT STATUS OF THE THEORY OF HEREDITY.

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### A REVIEW OF RECENT LITERATURE.

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By W. M. SMALLWOOD, Ph. D., of Syracuse, N. Y.

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1. Bateson: Address of the President of the British Association for the Advancement of Science. (*Science*, 1914, Vol. 40, Nos. 1026, 1027.)
2. Castle and Hadley: The English Rabbit and the Question of Mendelian Unit-Character Constancy. (*Proc. National Acad. Sci.*, 1915, Vol. 1.)
3. Castle: Some Biological Principles of Animal Breeding. (*American Breeders Magazine*, 1912, Vol. III.)
4. Holmes: Are Recessive Characters Due to Loss? (*Science*, 1915, Vol. 42, No. 1079.)
5. Wilson: Some Aspects of Progress in Modern Zoology. (*Science*, 1915, Vol. 41, No. 1044.)
6. Bateson: Mendel's Principles of Heredity. Cambridge University Press (G. P. Putnam's Sons, New York).
7. Bateson: Problems of Genetics. Yale University Press, New Haven, Conn.
8. Castle, Coulter, Davenport, East and Tower: Heredity and Eugenics. University of Chicago Press.
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A distinct theory of heredity was first announced in 1868 by Charles Darwin. Lamarck in 1809 assumed that there was a specific manner in which acquired modifications are produced during the life of the organism, which wholly or in part are transmitted to their offspring. However, this early belief offered no explanation.

It is interesting to compare Darwin's provisional hypothesis with the present day Mendelian conception. In order that the sex cells shall be able to reproduce the infinitely numerous characters of the adult, Darwin assumed that the multitude of living units in the organism each gave off minute gemmules or pangens. These

gemmules circulate in the body and finally locate in the sex cells. "Gemmules are supposed to be thrown off by every unit, not only during the adult state, but during each stage of development of every organism; but not necessarily during the continued existence of the same unit. Lastly, I assume that the gemmules in their dormant state have a mutual affinity for each other, leading to their mutual affinity for each other, leading to their aggregation into buds or into sexual elements. Hence it is not the reproductive organs or buds which generate new organisms, but the units of which each individual is composed. These assumptions constitute the provisional hypothesis which I have called pangeneses" (Darwin).

Galton has the merit of devising an experiment which convincingly demonstrated the failure of Darwin's hypothesis. This was done by intertransfusion of blood in distinct varieties of rabbits. Such rabbits gave offspring that showed no inherited characters other than from the parents.

Two important inferences may be made in regard to the germ cells at the time Darwin published his hypothesis of pangeneses:—

1. The germ cells were assumed to be too simple to reproduce a new individual.
2. The germ cells were solely responsible for the transmission of characters to the offspring.

Since 1886 there have been several theories of heredity which have been popular with scientific thinkers for a longer or shorter period and to whom Spencer, Altmann, Weismann, Naegeli, Roux, Driesch, and others are familiar. But none of these were as successful in analyzing the phenomena of heredity as Mendel and the recent students who have contributed a large literature within the past ten years.

The full meaning and import of the Mendelian theory of heredity is better appreciated, if we first examine the general character of the sex cells as compared with the other cells of the body.

The human body is very complex and composed of countless thousands of cells. Set apart from the work-a-day cells of the body are the germinal glands. The cells in these two glands do not continue to develop during the growth of the organism but remain in a simple and primitive state. Coulter claims that this is really a loss in reproductive power, for he correctly says "this means that in the complex plant body, the relatively few reproductive cells are not so much cells set apart for the special function as cells that have lost this primary power. The specialized cells are not those that reproduce, but those that cannot. The loss of reproductive power is usually not complete, for most cells can reproduce their own kind, even if they cannot reproduce the whole body."

Complete reproductive power is then defined as (1) cells that grow new cells; (2) these same cells must become differentiated and (3) form definite organs; (4) the complete growth product must constitute a definite individual. These four steps are accomplished in all higher animals through the union of the ovum and sperm.

The human ovum is grown in the ovary which contains approximately 72,000 ova at puberty. Each one is a minute spherical body with a diameter of  $1/5$  mm. There are the typical nucleus and granular cytoplasm.



The human sperm cell is a minute, elongated whip-like body, with one end enlarged. Sperms average about  $1/20$  mm. in length. The large end is the modified nucleus of the spermatocyte. Parker states that "it has been estimated that in the period of thirty years, between the twenty-fifth and fifty-fifth year of manhood, one individual will produce the prodigious number of 339,385,500,000 spermatazoa." These figures serve to give one a feeling that mere chance determined that certain characters are combined in him. Jennings expresses this idea as follows: "On this basis, what are the chances that I should ever have existed; that the particular combination which produced me should ever have been made? According to competent authorities, one of the two preexisting combinations, from which my combination was derived, possessed more than 17,000 germ cells, while the other produced the very considerable number of 339 billions of germ cells. So far as conditioned by the characteristics of these germ cells, any one of the 300 billions might have united with any one of the 17,000; any combination was a priori as probable as any other, and the chance that my particular combination should have been formed was therefore but one in five millions of billions! Gentlemen, I must congratulate myself on my fortune in being present with you this evening."

When any considerable numbers of individuals are studied, it is found that about as many characters can be traced to the father as to the mother, although the quantity of protoplasm contributed by the father is only estimated to be but  $1/35,000$  of the volume of the ovum. This must mean that disparity in size affords no clue to the physical process of heredity.

The history of the germ cells before they reach maturity has served to concentrate the investigations of recent years upon the chromatin in the nucleus. Primordial germ cells divide many times in a regular manner and distribute the chromatin in equal amounts to the forming cells. This stage is termed the oogonia for the cells that will mature into ova, and spermatogonia in the cells that are to become sperms. After a time this stage is followed by one in which the chromosomes fuse in pairs to split later longitudinally, during which particular change the cytoplasm does not divide. The germ cells are now ready to pass through a period of maturation. During this stage the ovum forms first a polar cell that contains one half of each of the chromosomes, which divide transversely. The chromosomes which remain in the egg do not form the typical nucleus after the first polar cell is extruded, but immediately separate into two groups, one half of the number of the chromosomes remaining in the ovum, one half passing into the second polar cell. In this last change there is a qualitative division of the chromosomes.

The changes in the chromosomes of the spermatocyte is similar except that each of the four cells resulting from maturation becomes mature sperms, while in the ovum the three polar cells degenerate. It is at once apparent that the sperms are not all alike, and this is the basis of the modern theories of sex determination.—a subject which will be reviewed in a later paper.

The ovum after it has extruded two polar cells and the sperms have separated in the above manner are each said to be mature. The ovum can now be fertilized by a sperm and the sperm is capable of penetrating into the ovum.

The material substance that is responsible for transmitted hereditary characters is the chromatin. Each species has a definite number of chromosomes; for example, man has 46 and the parasitic thread-worm, *ascaris*, but 4; the protozoan, *paramecium*, has 160. What can be said of the weight and quantity of this important substance? Parker has worked out these relations: "The human egg is approximately a sphere with a diameter, in the case of a large example, of about  $1/5$  mm., and with a specific gravity about that of water; consequently its weight must be about 0.004 grm. The volume of the chromosomes in a fertilized mouse egg has been determined to be somewhat less than one-thousandth of the volume of the whole egg, and assuming that this proportion holds for the human egg, and that its chromosomes have about the same specific gravity as water, the weight of this material would be about 0.000,004 grm. Yet this amount of substance is believed to determine to a nicety that infinity of adult traits wherein a man resembles his parents. If we assume the weight of the average human being to be 65 kgrm., then the weight of the determining material to that which is determined is as 1 to 16,250,000,000,000.

"We are now in a position to appreciate better the Mendelian hypothesis of heredity. Wilson, in speaking of scientific progress, says that foremost among the new discoveries stands the rediscovery of Mendel's long-forgotten law of heredity—a biological achievement of the first rank, which in the year 1909 suddenly illuminated the obscurity in which students of heredity had been groping. In the era that followed, the study of heredity quickly became not only an experimental but almost an exact science, fairly comparable to chemistry in its systematic employment of qualitative and quantitative analysis, synthesis, prediction and verification. More and more clearly it became evident that the phenomena of heredity are manifestations of definite mechanism in the living body. Microscopical studies on the germ cells made known an important part of this mechanism and provided us with a simple mechanical explanation of Mendel's law."

Gregor Johann Mendel, a monk of the monastery of Bruenn in Bohemia, spent eight years experimenting in crossing varieties of the edible pea. His method was to select plants having discontinuous characters and to follow out the subsequent fate of such characters in various forms of crossings. Until this time the individual had always been regarded as a unit, and so it was believed that any sorting of characters was impossible. This is a really great step in advance, for now we think of tallness, eye color, musical ability, or resistance to disease as unit-characters that can be transmitted as units to a new individual without necessarily carrying with them all the characters of the parents. In order that these unit characters shall appear in offspring, they must be previously represented by a so-called determiner in one or both sex cells. These determiners are believed to keep their identity and are passed on into the newly formed sex cells in each new individual. These determiners are located in the chromosomes and apparently have the power of growth. They do not migrate into the germ cells from all parts of the body as the pangens were believed to do.

When Mendel crossed a tall pea with a short pea, the hybrid offspring were all tall, and the determiner for tallness being stronger than the determiner for shortness, so all are tall. But when these

hybrids are self-fertilized, their offspring are both tall and short. This means that the original determiner for shortness was not lost in the first hybrid generation. By careful breeding plants can be selected from this second hybrid generation that will breed true for the factor of shortness. The two opposing characters of tallness and shortness are called dominant and recessive to each other. For several years now the general belief has been that a dominant character possessed some factor which was absent in its recessive alternative, and this is what is meant by the presence-absence theory of heredity.

Out of the conception of Mendel has grown an enormous literature during the past fifteen years and the whole subject of heredity has been greatly enriched. Unfortunately for the theory, there are some exceptions which even attack the most fundamental principle,

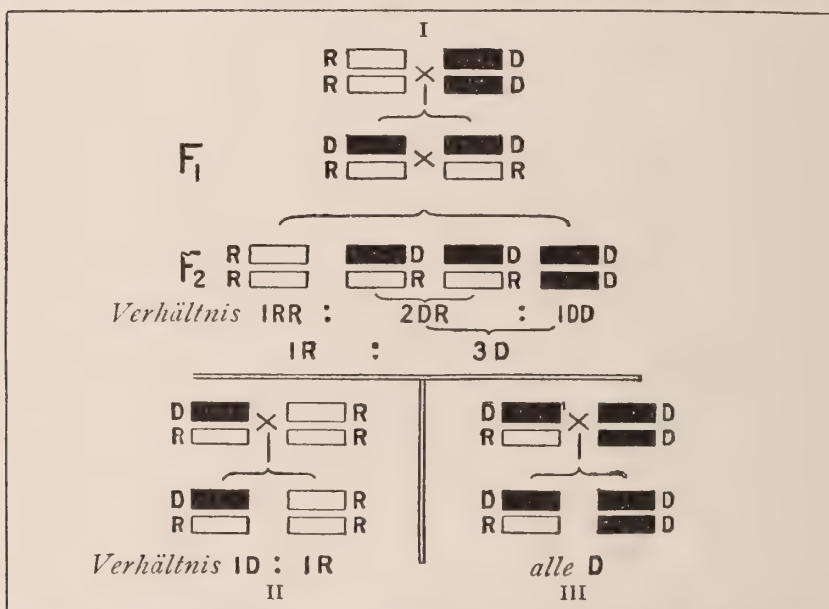


Diagram showing the numerical results according to the Mendelian theory.

*i. e.*, the purity of the germ cells. The purity of the germ cells means that whatever the character of the hybrid, its mature germ cells will bear but one of the opposing characters.

Castle has been carrying on a series of experiments to test the purity of the germ cells. The practical breeder must be able to handle these Mendelian unit characters and through hybridization recombine them in desirable ways without essential modification during the process, if it is to be of any practical value to him. Only one of Castle's experiments will be described. Color patterns of mammals seem especially well adapted for these studies in gametic purity, as the colors are early differentiated and clearly Mendelize in crosses. The so-called English piebald rabbit presents an especially fine example of such a color pattern. "As foundation stock for the experiment, a single heterozygous English rabbit of standard character was selected. To mate with him, it was desired to obtain a distinct breed of rabbits, free from the English pattern



and as pure (uniform) in all respects as possible. For this purpose the Belgian hare was chosen. A buck and two does were found to breed true. From them was bred a stock of does very uniform in character, 12 of which, together with one of the parents, were mated with the selected English buck, and a total of 436 young were reared. Of these 210 are like the father and 226 are like their Belgian mothers.

"After this series of matings had been completed, a second series was begun in which the same 13 females were mated with one of the darkest bucks produced in the first set of offspring. This series of matings produced 189 English young, together with a like number of self (non-English) young. The male used in the second series of matings differed genetically as well as somatically from his father who sired the first series. Not only was he darker, but he also produced darker English young. Yet the father contained only a single dose (one gamete) of English pattern and the son derived his English pattern exclusively from this same source. Hence the English unit-character had changed qualitatively in transmission from father to son. This seems to us conclusive evidence against the unit-character constancy, or gametic purity. If unit-characters are not constant, selection reacquires much of the importance which it was regarded as possessing in Darwin's scheme of evolution, an importance which many have recently denied to it.

"But some may say, you have considered merely one sort of unit-character; grant that this is modifiable, what of the numerous other ones which have been described? In reply I can only say that I confine my attention to one for lack of space. I have not limited my study to one, and I have yet to meet with a unit-character which is not both variable and modifiable. It is only by closing one's eyes to minor variations that one can see gametic purity in heredity."

There are several papers by Castle along this line which will open up anew the question of the nature of the germ cells as to gametic purity. The general subject of heredity is again facing a new series of investigations which in a few years may throw some more light upon the mechanism of heredity. The present Mendelian hypothesis assumes that the germ cells contain the determiners which have the potential power to initiate the several changes which result in all of the characters appearing in their right relations in the adult. This is just the opposite of Darwin's pangenesis. One of the difficulties which some thinkers have in accepting such a theory as Mendelism is that it postulates so much for the germ cells. Bateson, carrying out the logical implications of some of our modern theories of germ cells, suggested that evolution was from the complex to the simple. "I feel no reasonable doubt that though we may have to forego a claim to variation by addition of factors, yet variation both by loss of factors and by fractination of factors is a genuine phenomenon of contemporary nature. If then, we have to dispense, as seems likely, with any addition from without we must begin seriously to consider whether the course of evolution can at all reasonably be represented as an unpacking of an original complex which contained within itself the whole range of diversity which living things present." As the numerous investigators continue their studies we shall have to await their contributions.

From the medical standpoint one of the chief results of Mendelism has been its application to man. Here the attention given to unit-characters has been very profitable, especially in the numerous studies of imbecility, alcoholism, bleeders, thrift, intellectual ability, etc. In the literature I am citing some of the recent books that are especially useful to physicians, for this phase of the subject is too extensive for a summary. If the conclusions of Castle are confirmed by other investigators, then we shall have to soften our conclusions in regard to some of the present-day so-called laws of genetics and especially eugenics.

## THE NATURE OF THE ABDERHALDEN REACTION.

## A REVIEW OF RECENT LITERATURE.

By MOYER S. FLEISHER, M. D., of the Editorial Staff.

1. De Waele (*Zeitschr. fuer Immunitätsforsch.*, 1914, Vol. XXI, p. 170).
2. Bronfenbrenner, Mitchell and Schlesinger (*Biochem. Bull.*, 1914, Vol. III, p. 386).
3. Bronfenbrenner (*Proc. Soc. Exper. Biol. and Med.*, 1914, Vol. XII, Nos. 3, 4, 6 and 7).
4. Bronfenbrenner and Scott (*Proc. Soc. Exper. Biol. and Med.*, 1915, Vol. XII, p. 137).
5. Bronfenbrenner (*Biochem. Bull.*, 1915, Vol. IV, p. 87).
6. Bronfenbrenner (*Jour. Exper. Med.*, 1915, Vol. XXI, pp. 221 and 480).
7. Jobling, Eggstein and Petersen (*Jour. Exper. Med.*, 1915, Vol. XXI, p. 239).
8. Jobling, Petersen and Eggstein, (*Jour. Exper. Med.*, 1915, Vol. XXII, p. 401).

Ever since Abderhalden first announced that he had shown the presence of specific ferments in the blood of mammals after the introduction of foreign proteids into the blood-stream, discussions have waxed upon the specificity of these ferments and the nature of this reaction which Abderhalden had shown could be applied to the clinical diagnosis of pregnancy. From the first, Abderhalden has contended that the ferments, which were produced as a result of the parenteral introduction of a foreign proteid, were specific and that those investigators who were not able to confirm his results in this regard were not carrying out their work in the proper manner. In short, Abderhalden's contention was that as the technique of the reaction was very complicated and required very painstaking precautions, no results were to be accepted as correct unless they agreed with the results which he had obtained. A number of investigators, both here in the United States and abroad, failed to agree with Abderhalden, as regards the nature of the ferments and as to the value of the test as a clinical adjuvant; and many of these investigators were men who had received their training in Abderhalden's laboratory, and whose attainments were such as to make them as worthy of confidence as Abderhalden.

The entire discussion served only to cast doubt upon the test and to leave its clinical value in question. That there were ferments present in the blood of individuals into whose blood-stream foreign proteids had been introduced, was not to be doubted; but the exact manner of production of these ferments and their nature were distinctly in doubt. The work of the last year and a half



has served to determine definitely the nature of these ferments and their relation to the substances which call them forth and towards which, according to Abderhalden, they bear a specific relation.

The work of de Waele, Bronfenbrenner, Jobling and their collaborators has served practically to clear the atmosphere and will go a long way towards explaining the conflicting results obtained by various observers. These three investigators have each approached the same problem from somewhat different points of view, and the work of one serves to amplify the work of the others. The results of any one of these men would be sufficient to give us a clear idea, but the correlation of the three points of view gives us a broader and more definite basis.

The Abderhalden reaction is carried out by permitting serum from the individual to be examined (as a rule a supposedly pregnant woman) to act for about eighteen hours on the substrate—the material against which the ferments have supposedly been produced. (In the case of the supposed pregnant woman the substrate would be some specially prepared placental tissue.) After the serum and the substrate have been in contact at body temperature for eighteen hours, in a small sack which will allow lower products of proteid digestion to pass through, but will not allow the more complex proteids, an examination of the fluid surrounding the sac for the presence of these lower products is made. If these lower split products are shown to be present, the test is considered positive and, according to Abderhalden, the specific ferments which were produced in the pregnant woman against placental tissue digested the placenta used as the substrate.

Bronfenbrenner carried out the usual Abderhalden test of placing the serum and substrate in the dialyzing thimble, but instead of allowing these to digest at the body temperature, he kept them in the ice-box for eighteen hours. It is known that if corpuscles and hemolytic serum are kept in the ice-box, the corpuscles will take up the antibodies, but even if the necessary complement be present the corpuscles will not be hemolyzed. The action of enzymes is also prevented or retarded by exposure to the temperature of the ice-box. Therefore, as was to be expected, the examination of the fluid, surrounding the thimble in which the serum and substrate had been kept, failed to show the presence of any of the lower proteid products (peptones).

The serum and the placental tissue were now separated and again placed in thimbles,—after the placenta had been washed to free it of any adherent serum. The serum was now allowed to dialyze at body temperature for eighteen hours; and to the substrate there were added in separate thimbles, sodium chloride solution, fresh guinea-pig serum, heated guinea-pig serum, and serum of a normal male. When the dialysate from these various thimbles was tested, it was found that the separated serum which had been in contact with the placenta now showed the presence of peptones, while the placenta which had been placed with sodium chloride solution showed no reaction. Evidently the digestion could go on even when the placenta was not present, and the sensitization of the placental tissue—if we may so call the action of the serum upon the placenta in the ice-box—had not so changed the tissue that it was digested. However, if the sensitized placenta was placed in the thermostat

either with fresh guinea-pig or normal male serum, it was possible to obtain a positive reaction.

These results can lead to the following conclusions. Had dializable substances been formed while the serum and the placenta were mixed in the ice-box, these would have appeared in the dialyzed fluid tested immediately after removal from the ice-box. While such substances were not formed in the ice-box, it is evident that the serum was affected while mixed in the ice-box with the placenta in such a manner that when separated from the placenta and placed at body temperature it was digested with the production of dializable substances; on the other hand, the placenta was not able to produce dializable substances when placed at 37° C. with salt solution. It would therefore appear that the dializable substances arose from the serum and not from the placenta, and that the contact of the serum with the placenta had prepared the serum for digestion.

The fact that the placenta, sensitized by the action of the serum, when combined with normal human or guinea-pig serum led to the production of dializable substances, shows, as a result of the action of the pregnant serum on the placenta, that the latter was so affected that it served to activate even normal serum to digest itself.

It has for a long time been known that there exist in normal sera both ferments and antiferments, and these are supposed to balance each other in such a manner that the normal constituents of the serum are not digested. It has further been shown by Jobling and Petersen that at least one class of substances which may act as antiferment is the fatty acids, and especially in the unsaturated fatty acids.

Since it has been pretty definitely shown by Bronfenbrenner that the dializable substances in the Abderhalden reaction are produced by the action of ferments of the serum acting upon the proteids of the serum, and supposedly upon the globulins of the serum, it is natural to argue that the Abderhalden reaction is the result of the removal of the antiferment which occurs as a result of some reaction of the specific antibody contained in the serum with its specific antigen—namely, the placental tissue. The Abderhalden reaction is therefore reduced to very much the same kind of a reaction as the usual immune reactions, a reaction between a specific antibody and its antigen. The reaction, therefore, seems to be specific, but the ferment acting in the production of the dializable substances is evidently not specific.

Jobling, Eggstein and Petersen do not believe that the reaction outlined by Abderhalden is specific, but that the apparent specificity is due to the fortuitous circumstance that the placental tissue serves very well for the absorption of the antiferment of the serum. De Waele, Bronfenbrenner and his collaborators believe that the reaction is specific, at least so far as the reaction between the placenta and the serum of the pregnant patient is concerned (this reaction serving to remove the antiferment, but not to produce the dializable substances). Both de Waele and Bronfenbrenner believe that the reaction is in the nature of a physicochemical reaction, while Jobling and his co-workers consider the reaction as the absorption of the antiferments, which according to their belief is the unsaturated fatty acids. More recently Jobling has admitted the probable importance of physico-

chemical changes in the serum as influencing the liberation of the ferment of the serum. It may be stated that absorption may play a part in the Abderhalden reaction, for when serum from normal individuals is mixed with inert substances such as kaolin or barium sulphate, or with large quantities of placental tissue, dializable substances may be produced, apparently due to the mechanical absorption of the antiferment. However, only in the quantities used in the Abderhalden reaction does the specific reaction take place.

Jobling further states that after the placental tissue has been mixed with the serum, it becomes more resistant to enzyme action as a result of the absorption of the antiferment. He finds that when the sensitized placental tissue is exposed to the action of trypsin it is not as readily digested as is untreated placental tissue.

Whether there is any action of the ferments of the serum on the placental tissue does not seem to be either definitely proved or disproved, but it seems likely that the substrate is acted upon to a slight degree. It does seem to be proved that it is chiefly the globulin fraction of the serum which is attacked by the serum ferment.

It appears, therefore, that the Abderhalden reaction is a specific reaction resulting from the changes brought about by the combination of the substrate and the specific substances in the serum—similar in all respects to the combination of antigen and antibody. As a result of this specific reaction the antiferments are either absorbed by the solid substrate, or certain physicochemical changes are brought about in the blood which render the antiferment inactive; that is, following the removal or inactivation of the antiferment, a non-specific enzyme of the serum digests the globulins of the blood, and may act to a slight extent upon the substrate. This digestion of the globulins leads to the development of dializable substances, and the evidence of a positive Abderhalden reaction.



## DIAGNOSTIC AND THERAPEUTIC NOTES.

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OPEN PLEURAL PUNCTURE.—Schmidt (*Muench. med. Wochenschr.*, 1915, No. 26); Stepp (*Ibid.*, No. 31). For the purpose of evacuating the fluid in pleuritic effusions, Schmidt, of Halle, recommends what he calls the method of open puncture. An ordinary trocar, without any aspirator attachment, is thrust through the thoracic parietes, and the fluid allowed to flow out and the air in, without interference on the part of the operator. The fluid is not aspirated, nor the air blown in, but the pressure within the pleural space remains equal to that of the atmosphere. In this way, we are told, all of the unpleasant complications of aspiration, such as cough, syncope, pulmonary edema, albuminous expectoration, may be avoided.

The technique is simple. The trocar used should be 8 cm. long and 0.4 cm. thick. Two beds are placed side by side, at such a distance apart that when the patient lies across them on his affected side, his shoulder rests comfortably on one bed, his hips on the other. The trunk then hangs between the two beds, with the site to be tapped at its most dependant portion. The trocar is introduced in the usual manner and the stilet withdrawn. If, as is usually the case, the fluid is under pressure, it immediately flows out until the pressure within and without the chest are equal. Then with each inspiration, air bubbles into the pleural cavity while, with each expiration, fluid is forced out. A hydropneumothorax is formed, with the fluid at its most dependant portion around the trocar. The last traces of fluid are removed by slowly withdrawing the trocar until only air hisses in and out with each respiration. The trocar is withdrawn during deep expiration or while the patient coughs. This is important, for the amount of air then remaining in the pleural space is reduced to a minimum.

Stepp points out that while this method has its advantages it results in a partial and temporary collapse of the lung on the affected side. It is a safe procedure only when the other lung is functionally adequate. It is therefore dangerous when the exudate is bilateral and especially if there is also a pericardial exudate.

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TREATMENT OF TYPHOID FEVER BY STOCK TYPHOID VACCINES.—Wiltshire and MacGillicuddy (*Lancet*, September 25th, 1915). On the basis of 50 cases of typhoid fever, treated by means of the stock therapeutic vaccine supplied from the Royal Army Medical College, the writers come to the following conclusions:—

1. Stock typhoid vaccine is a valuable therapeutic agent for the treatment of typhoid fever.
2. The treatment should be started as early as possible with an initial dose of 250,000,000.
3. A reasonable suspicion that a patient is suffering from typhoid fever is sufficient indication for commencing vaccine treatment.

4. The treatment is quite harmless to patients who may subsequently be proved not to be suffering from typhoid fever.

5. An interval of three days should be given between doses. Shorter intervals are not well tolerated. When a longer interval is given, if four days, the dose should not be increased, if over four days, the dose should be reduced.

6. Great care must be used in dosage if secondary infections of the lung are present. If possible, the typhoid vaccine should be combined with a vaccine suitable for the secondary infection.

7. Doses should be continued for ten days after the temperature is normal as a preventive against relapse.

8. Preventive inoculation exerts, slight, if any, influence on subsequent vaccine treatment.

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TREATMENT OF SCABIES.—Unna (*Berl. klin. Wochenschr.*, 1915, No. 14). Unna praises Sherwell's treatment of scabies. As long as the latter is not complicated by eczema, it suffices to rub sulphur (sulph. depurat. pulv.) into the infected areas. The patient keeps the sulphur by him, and whenever he feels any itching, he at once, day or night, rubs some of the sulphur over the itching area, instead of scratching it. The effect is as certain and less irritating than with the more drastic methods.

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TREATMENT OF SCAR TISSUE.—Reimann (Vienna Medical Society, May 7th, 1915). Scars, even those leading to the extremest contractions, may be softened by painting them with

R	Pepsin. . . . .	50.0
	Acid. hydrochloric. (0.2%) . . . . .	1000.0,

so that they may be massaged and stretched without pain.

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RELAPSE AFTER THE USE OF EMETINE IN AMOEBIC DYSENTERY.—Barlow (*New York Med. Jour.*, October 23rd, 1915). The writer has kept a card index of all cases of dysentery treated at a plantation in Honduras. Forty cases were examined from 8 to 14 months after cessation of treatment. He concludes that about eighty per cent. or more of cases of infection with *endamoeba histolytica* remain free from relapse for seven months or more, if treated for at least ten days continuously and with not less than one grain daily of emetine.

If treated for less than nine days, relapse is almost inevitable.

The simultaneous administration of ipecac does not diminish the number of patients who show relapse; but the subsequent administration does diminish the number.

A permanent cure is possible in a shorter time with emetine than with ipecac.

It is preferable to inject the daily dose at one time, or at least in doses of not less than one grain.

The bowels should not be flushed with frequency. If there is marked diarrhea, opiates should be given in sufficient quantity to control it. The patient is relieved of suffering, and the retention of the emetine hastens the cure and decreases the likelihood of relapse.

If the patient can do so, he should report monthly for at least six months to someone competent to recognize either cysts or vegetative forms. Examination should be made after a saline, and immediately after the stool is passed. If either is found, another course of emetine, of at least one grain daily for nine days, should be given.

The alternative is the continuous or intermittent use of ipecac for at least six months, or successive courses of emetine of at least nine days.

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CHARCOAL IN THE TREATMENT OF INFECTED WOUNDS.—Knaffl-Lenz (*Muench. med. Wochenschr.*, 1915, No. 18) ; Langemak (*Zentralbl. f. Chir.*, 1915, No. 23). At Eiselberg's clinic, in Vienna, animal charcoal has been found most useful in infected wounds and cavities. The former are first rinsed with peroxide and gently mopped with sterile gauze. Finely powdered animal charcoal is then blown over the wound until the latter is colored a deep black. A dry dressing is applied. This procedure is repeated every day, the carbon being rinsed off each time, except in the most necrotic portions, to which it clings firmly. After a few days, however, these portions can be lifted away with forceps. Old suppurating wounds heal more quickly than with any other treatment. Deep penetrating wounds and infected cavities may be flushed out with a 2 or 3 per cent. suspension. This applies even to the pleural space.

Langemak expresses himself enthusiastically as to the value of roasted sawdust in the treatment of infected wounds. It is a very fine sawdust, roasted until it has become somewhat darkened, and unites the absorbent power of sawdust with the antiseptic action of charcoal. It is marketed under the name of Skobitost, but is readily prepared extemporaneously.

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LIME THERAPY OF DIABETES.—M. Kahn and M. H. Kahn (*Med. Record*, October 30th, 1915). In a number of metabolism experiments conducted on diabetic patients, the writers invariably found an increased calcium output, leading to a loss on the part of the body of lime salts. A similar increase of the calcium output has been found in a great variety of other diseases characterized by a hyperglycemia. On this theoretic basis, the writers have investigated the effect upon the sugar excretion in diabetes of the administration of calcium salts, apparently with satisfactory results, as indicated by the following example:—

The patient, a middle-aged woman, was excreting on a standard diet, from 90 to 115 grm. of sugar daily. Upon treatment with lime, the diet remaining the same, in a manner to be subsequently reported, her glycosuria fell in less than ten days to less than 10 grm. of glucose per day. The glycemia ran a parallel course.

They hope soon to make a complete report of the results of their investigations.



## BOOK REVIEWS.

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A REFERENCE HANDBOOK OF THE MEDICAL SCIENCES. Embracing the Entire Range of Scientific and Practical Medicine and Allied Science. By Various Writers. First and Second Editions by Albert H. Buck, M. D. Third Edition, Completely Revised and Rewritten. Edited by Thomas Lathrop Stedman, A. M., M. D. Complete in Eight Volumes. Volumes I, II, III, IV and V (A-L). Illustrated by Numerous Chromolithographs and Half-Tone and Wood Engravings. New York: William Wood and Company. 1915.

A popular prejudice obtains to-day against Reference Handbooks, perhaps on account of the number of volumes in each series, perhaps on account of the mass of matter that is badly arranged and edited with poor judgment. This criticism may apply to works that are put out by publishers for pecuniary gain only, and with no other thought than to beguile the general practitioner, and especially the medical man in country towns, into the belief that heavy and voluminous tomes when stacked on his library shelf are a continual joy to him and also to his patients, no matter what the contents. No such unkind comment could possibly be made in connection with "A Reference Handbook of the Medical Sciences," for in the five volumes which have appeared there are many indications that here at last we have a series of books of such merit that even the most prejudiced person against handbooks must admit that all adverse criticism is unarmed.

To single out some of the chapters in the five volumes would be doing an injustice to others that should be mentioned on account of their admirable qualities; therefore, the reviewer will refrain from this method of criticism and consider each volume as a whole. Each volume bears the enviable marks of careful editorship and of excellent judgment in the selection of the writers; and each writer seems to vie with another to bring his best thought, his most earnest endeavor, and his complete knowledge to the perfecting of his contribution. The result of all this is that not only are diseases not described in the perfunctory way, but historical notes are introduced to show what was thought of them in early times and what the progress toward a better understanding, as evidenced to-day, has effected. While mentioning the historical features in the history of many diseases, it would be well to mention here the biographical sketches interspersed throughout the five volumes. These are written with great care and with enough knowledge to make them an excellent source of information for all writers who wish to use such matter for future articles.

On account of the variety of subjects treated and also on account of the excellence of performance, this work can be commended in the highest terms. The hypercritical may see some slight defects which are not apparent to the reviewer, but of every work of large proportions, running through many volumes, something adverse may be said. Pettiness in criticism never re-ounds to a critic's reputation, and in the presence of a work, such as is under consideration, to say naught but praise would be completely out of place. And let us add that no medical man, who wishes an encyclopedia that bulks large with a great variety of outstanding articles, need fear that in buying this work he is being again outwitted by the lure of distinguished names followed by undistinguished performances.

DISEASES OF THE DIGESTIVE ORGANS. With Special Reference to Their Diagnosis and Treatment. By Charles D. Aaron, Sc.D., M. D., Professor of Gastroenterology in the Detroit College of Medicine and Surgery, etc. etc. Illustrated with 154 Engravings, 48 Roentgenograms and 8 Colored Plates. Philadelphia and New York: Lea and Febiger. 1915. Price, \$6.00.

In a day in which the intensive study of the digestive tract has often caused us to lose sight of those broad principles which underlie the entire science of medicine, Aaron's book is doubly welcome. For the author never forgets that he is dealing with a branch of internal medicine; he never

makes the error of treating the patient's gastro-intestinal canal and forgetting the patient himself. The first chapters are devoted to the physiology of digestion. The chapters on methods of examination include a chapter on *x-ray* examinations containing a number of excellent skiagraphs. The pages devoted to foods and diets are particularly valuable. The author's large practical experience makes him realize most keenly that the subject of diet in disease means something more than the juggling of a table of caloric values. He very properly emphasizes the all-important point that the manner in which food is prepared and the form in which it is served is the first consideration in the dietetic management of gastro-intestinal diseases. The manner of the preparation of food, and not the kind of food, should be the chief distinguishing feature between the diet of the sufferer from gastro-intestinal disease and the healthy man. It is unfortunate that these facts have not yet gained acceptance, that they are usually ignored by writers of textbooks on dietetics, and that scant consideration is given to them in our medical schools.

A more general resort throughout the book to free discussions, such as characterize the chapter on appendicitis, would prove valuable, and it seems would be distinctly in place in a work devoted to a special phase of medicine.

One would likewise welcome a more critical attitude on the part of the author towards the various laboratory and diagnostic aids. The same emphasis is given to tests which have been practically discredited, such as the glycythryptophan test and the Cammidge reaction, as is accorded to procedures of proved accuracy and value like Weber's guaiac test for occult blood.

On the other hand, the author does not hesitate to set forth his own therapeutic ideas; and while some of these, such as the hypodermic use of sea water in the treatment of nervous dyspepsia, seem quite bizarre, they in no way detract from the general value of the book.

There is a complete index, but it would seem that a few of the more important literature references might, with much benefit to the student, be appended to each chapter.

**A PRACTICAL TREATISE ON DISEASES OF THE SKIN.** For the Use of Students and Practitioners. By Oliver S. Ormsby, M. D., Professor and Head of the Department of Skin and Venereal Diseases, Rush Medical College (In Affiliation with the University of Chicago), etc. etc. Illustrated with 303 Engravings and 39 Plates in Colors and Monochrome. Philadelphia: Lea and Febiger. 1915. Price, \$6.00.

In the preparation of this work the author has freely used parts of the treatise of his illustrious colleagues, the late Dr. James Nevin Hyde and Dr. Frank Hugh Montgomery. As everyone knows who is at all familiar with dermatological literature, the treatises by Hyde and Montgomery are classics in the literature. Ormsby assisted the authors in the preparation of the last volumes; and in this, his present effort, he has continued the same high standard as that of his predecessors.

The fact that struck the reviewer at once was the wealth of literature quoted. The footnotes are very extensive and every subject is brought up to the date of the publication of the book. This, of course, entails vast labor and is of the greatest value to the reader. Foreign, as well as domestic, authors are freely quoted. The author has retained the classification of his predecessors, the one usually adopted by textbook writers. The chapter on general therapeutics should be of great value to the practitioner, as it gives him more than the usual insight obtained from such books upon the treatment of skin diseases. Throughout the whole volume this phase has been emphasized, and the treatment recommended is concise, comprehensive and accurate.

Illustrations are always a great assistance to the proper understanding of dermatological entities, but usually they are so poorly reproduced that it renders them of little value. However, in Ormsby's work, they are most excellently reproduced and carefully selected. He has called upon his friends and colleagues for their best photographs of given groups and has therefore in this way been enabled to command a large material and to select from them the most appropriate reproductions. His publishers have ably assisted him in making this feature of the book most excellent.

The wide experience of the author for the last fifteen years (and he has been a careful student for many years) has enabled him to write authoritatively upon the subject of skin diseases. Therefore, he has infused into this volume a personal factor that is wanting in most textbooks. Anyone who knows the



author intimately can recognize him in the pages of his book: in its diction, painstaking care, accuracy, comprehensiveness, modesty, and in the quotations of literature and clearness of outline. Years of study and experience have resulted in a work of exceeding merit.

**DISEASES OF INFANTS AND CHILDREN.** By Henry Dwight Chapin, A. M., M. D., Professor of Diseases of Children, New York Post-Graduate Medical School and Hospital, etc. etc.; and Godfrey Roger Pisek, M. D., Sc. D., Professor of Diseases of Children and Attending Physician to the New York Post-Graduate Medical School and Hospital, etc. etc. Third Revised Edition. With One Hundred and Seventy-Nine Cuts and Twelve Colored Plates. New York: William Wood and Company. 1915. Price, \$3.25.

This is really a valuable textbook. Though the subjects are treated in condensed form, clearness has not been sacrificed. The use of small type for the discussion of the rarer and less important diseases allows space for a fuller treatment of many other subjects. In the section on Examination of the Sick Child there are excellent chapters on special examinations—general therapeutics (with drug tables) and a very good suggestive scheme for diagnosis—modeled somewhat after the more extensive one in Pfaundler and Schlossman's work.

The section on Infant Feeding is very clear and filled with valuable details. Feeding of older children with carefully mapped-out dietaries forms a feature not always found in general textbooks.

The letterpress is excellent, and the third edition of this already valued work will surely meet with the warm reception it deserves.

**ORTHOPEDIC SURGERY.** By Edward H. Bradford, M. D., Consulting Surgeon to the Children's Hospital, Boston, and to the Boston City Hospital; and Robert W. Lovett, M. D., Professor of Orthopedic Surgery in Harvard University, etc., etc. Fifth Edition, Profusely Illustrated. New York: William Wood and Company. 1915. Price, \$3.75.

The fifth edition of Bradford and Lovett's well-known work on orthopedic surgery presents a careful revision and maintains the high standard of excellence of the earlier editions.

Over a quarter of the book is given up to a careful discussion of tuberculosis of bones and joints, and the presentation is a model of clear, concise statement with controversial matter properly eliminated. The whole field of orthopedic surgery is carefully gone over. The discussion of the orthopedic aspect of infantile paralysis forms a most excellent chapter.

The work has long been recognized as a classic by orthopedic surgeons; it deserves to find a place on the shelves of many a general practitioner, whose work brings him into contact with those forms of disease so ably handled here.

The general make-up of the work is most satisfactory and the many illustrations add not a little to the value of the work.

**THE CLINICS OF JOHN B. MURPHY, M. D., AT MERCY HOSPITAL, CHICAGO.** Volume IV, Number 5, October, 1915. Published Bi-Monthly. Philadelphia: W. B. Saunders Company. 1915. Price per year, \$8.00.

A footnote on the first page of this issue of the "Clinics" states that editorial revision has been undertaken by Dr. P. G. Skillern, of Philadelphia. This is a wise move in the proper direction, the evidences of which are clearly seen throughout the volume. Both Dr. Murphy and Dr. Skillern are to be congratulated. The general tone of continuity, the use of the subhead "Recapitulation," and the cross-references to topics treated in earlier numbers of the "Clinics" are all praiseworthy innovations.

The following topics are discussed: Carcinoma of the Tongue, Carcinoma of the Gum, Cicatricial Contracture of the Neck, Recurrent Dislocation of the Humerus, Gunshot Wound of the Arm, Fracture of the Lower End of the Humerus, Fracture Luxation of the Elbow, Fracture of Radius and Ulna, Empyema of the Pleural Cavity, Pericholecystitis and Pericolicis, Tuberculosis of the Fallopian Tubes, Sarcoma of the Ovary, Pyonephrosis, Ureteral Calculus, Retroperitoneal Sarcoma, Inoperable Recurrent Sarcoma of Nasopharynx, Metastatic Arthritis of the Knee, Old Hip-Joint Infection, Tuberculosis of the Knee, Painful Stumps, Pott's Fracture With Eversion.



**MODERN ASPECTS OF THE CIRCULATION IN HEALTH AND DISEASE.** By Carl J. Wiggers, M. D., Assistant Professor of Physiology in Cornell University Medical College, New York City. Illustrated with 104 Engravings. Philadelphia: Lea and Febiger. 1915. Price, \$3.75.

The special value of this book lies in that it was written not by a practising physician but by a professional physiologist. The general attitude is that of the laboratory, and it is for the application of methods of precision to the study of the circulation in health and disease that the book will most often be consulted.

The first chapters in which the most modern views of the physiology of the circulation are set forth are unquestionably the most valuable of all. For clearness and conciseness they leave little to be desired. The second section in which the instrumental study of the circulation in man is set forth, is apparently based rather on a study of the current literature than upon personal observation. The third section, on the other hand, in which the bearing of modern physiological notions upon the study of the clinical pathology of the circulation are brought out, will be found well worth study.

**THE CLINICS OF JOHN B. MURPHY, M. D., AT MERCY HOSPITAL, CHICAGO.** Volume IV, Number III (August, 1915). Published Bi-Monthly. Philadelphia: W. B. Saunders Company. 1915. Price per year: Paper, \$8.00; Cloth, \$12.00.

Along two very distinct lines do these "Clinics" of Dr. Murphy show improvement—the editing is incomparably better than heretofore, and the illustrations are admirable. In addition to this, the August number is characterized by the presentation of a more varied list of topics than any of the preceding five or six volumes. There are, in all, thirty-two case reports, some of which are of unusual interest. These various reports cover the following subjects: Syphilis, Parotid Tumors, Plastic Operations on the Nose, Carcinoma of the Lip, Osteomyelitis of the Jaw, Cranial Surgery, Spinal Surgery, Subacromial Bursitis, Carcinoma of the Finger, Musculospiral Nerve Injuries, Tuberculosis of the Sternum, Metastatic Thymus Tumor of the Breast, Lung Compression for Bronchiectatic Cavity, Cholelithiasis, Fecal Fistula, Papilloma of the Bladder, Fracture of the Patella, Fracture of the Internal Semilunar Cartilage, and Compound Fracture of Both Feet.

**HOW TO LIVE.** Rules for Healthful Living Based on Modern Science. Authorized by and Prepared in Collaboration With the Hygiene Reference Board of the Life Extension Institute, Inc. By Irving Fisher, Chairman, Professor of Political Economy, Yale University and Eugene Lyman Fisk, M. D., Director of Hygiene of the Institute. New York: Funk and Wagnalls Company. 1915. Price, \$1.00.

One of the objects of the Life Extension Institute is:—"To give especial attention to the teaching of the rules of personal hygiene or healthful living to the end that not only the ravages of communicable disease may be stayed, but that the increasing waste of vitality and human life from the chronic disease may be checked."

For the furtherance of this aim, the present book was written by its Director of Hygiene. It is a concise discussion of our modern notions of personal hygiene, sufficiently elementary in its method of presentation to serve the needs of the general reader.

**THE PRACTITIONER'S VISITING LIST FOR 1916.** Four Styles: Weekly, Monthly, Perpetual, Sixty-patient. Pocket size; substantially bound in leather with flap, pocket, etc. Philadelphia: Lea and Febiger. 1915. Price, \$1.25.

The above visiting list affords a simple and complete system for keeping the records of daily practice, since it contains ruled pages for daily calls and their notes, general memoranda, addresses, cash account, and also contains specially arranged spaces for data desired for permanent record.

The text portion of the Practitioners' Visiting List for 1916 contains much new information—scheme of dentition; tables of weights and measures and comparative scales; instructions for examining the urine; diagnostic table of eruptive fevers; incompatibles, poisons and antidotes; directions for effecting artificial respiration; extension table of doses; an alphabetical table of diseases and their remedies, and directions for ligation of arteries.

We heartily recommend the visiting list to all physicians as a necessity.

PRINCIPLES OF HUMAN PHYSIOLOGY. By Ernest H. Starling, M. D. (Lond.), F. R. C. P., F. R. S., Hon. M. D. (Breslau), Hon. Sc.D. (Cambridge and Dublin), Jodrell Professor of Physiology in University College, London. Second Edition, with 566 Illustrations, 10 in Colour. Philadelphia: Lea and Febiger. 1915. Price, \$5.00.

In our review of the first edition of this work we called attention to the author's broad point of view in handling his subject. His vigorous and interesting style and his manner of going to the very fundamental principles of his science evoked our favorable comment. The present edition is no less praiseworthy. A number of changes have been made to keep pace with the advances in our knowledge. The sections dealing with the voluntary muscles and with the circulation have been rewritten, and in every way the book has been brought up to date. We again welcome the opportunity of commending it most heartily to the profession.

A MANUAL OF SURGERY. For Students and Physicians. By Francis T. Stewart, M. D., Professor of Clinical Surgery, Jefferson Medical College, etc. etc. Fourth Edition. With 580 Illustrations. Philadelphia: P. Blakiston's Son and Company. 1915.

This "Manual" of Stewart's has been favorably reviewed in these columns as it has appeared in previous editions. There could hardly be more definite evidence of a need fulfilled than the call for a fourth edition.

Personally we cannot see the need for the excessive number of "Manuals" that fairly glut the market. Most of these books are as alike as two peas in a pod. This volume by Stewart is an exception to the rule, being better than the average, in fact, taking rank with the best. We can heartily recommend this work both to practitioners and advanced medical students.

THE PRINCIPLES OF BACTERIOLOGY. A Practical Manual for Students and Physicians. By A. C. Abbott, M. D., Professor of Hygiene and Bacteriology, and Director of the Laboratory of Hygiene, University of Pennsylvania. Ninth Edition, Thoroughly Revised. With 113 Illustrations, 28 of Which are Colored. Philadelphia: Lea and Febiger. 1915.

The present edition follows the general plan of the former one. Such changes have been made as would keep the book abreast of the subject. The work is particularly adapted to the needs of the student of medicine, and no pains are spared to make the subject clear to the beginner. This is especially true in describing the technique of the various bacteriological procedures. A book of this size which is accurate and complete must make a strong appeal to the student.

A MANUAL OF THE PRACTICE OF MEDICINE. Prepared especially for Students. By A. A. Stevens, A. M., M. D., Professor of Therapeutics and Clinical Medicine in the Woman's Medical College of Pennsylvania, etc. etc. Tenth Edition. Illustrated. Philadelphia and London: W. B. Saunders Co. 1915. Price, \$2.50.

The present edition follows the former plan of this work which has become familiar to the medical public. Despite the popularity which the book has enjoyed, one must always doubt the wisdom of attempting to set forth the subject of medicine in 600 small pages. Such a book can never be much more than a somewhat amplified dictionary.

OUTLINES OF INTERNAL MEDICINE. For the Use of Nurses. By Clifford Bailey Farr, A. M., M. D., Instructor in Medicine, University of Pennsylvania, etc. etc. Illustrated with 71 Engravings and 5 Plates. Philadelphia: Lea and Febiger. 1915. Price, \$2.00.

In this book an attempt is made to cover the entire field of internal medicine with especial reference to the needs of the trained nurse. No nurse surely will be expected to know anything like the entire contents of the book. Nevertheless she will find it a useful book of reference to have at hand.

THE MEDICAL RECORD VISITING LIST OR PHYSICIAN'S DIARY. FOR 1916. Newly Revised. New York: William Wood and Co. 1915. Price, \$1.50.

This well-known visiting list has been revised for the purpose of increasing its usefulness, especially when ready information is sought in emergencies. The most important change in this respect is noticeable in the list of remedies and their maximum doses. The entire arrangement of this visiting list is eminently practical.

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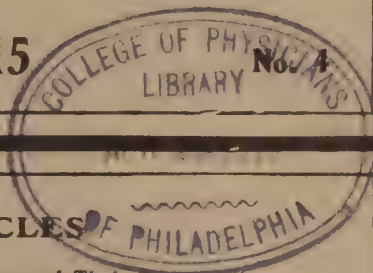
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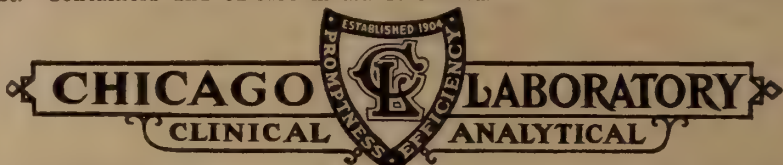
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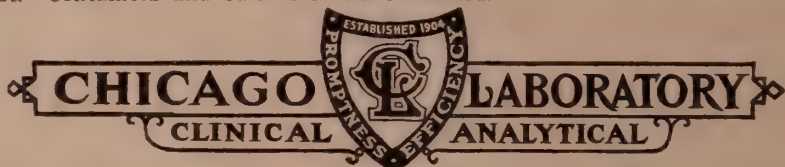
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- LISTERINE** embodies a two-fold antiseptic effect, in that after the evaporation of its volatile constituents—thyme, eucalyptus, mentha, gaultheria and ethyl alcohol—a film of boracic and benzoic acids remains upon the surface to which Listerine has been applied, affording more prolonged antiseptic protection.
- LISTERINE** is a trustworthy surgical dressing; it has no injurious effect upon the tissues in which the healing process is going on.
- LISTERINE** in proper dilution is useful in the treatment of abnormal conditions of the mucosa and forms a suitable wash, gargle or douche in catarrhal conditions of the nose and throat.
- LISTERINE** in teaspoonful doses will often afford relief in fermentative dyspepsia and is largely prescribed, with excellent results, in the various forms of diarrhoea occurring in infants and adults.
- LISTERINE** literature, including special pamphlets upon *Disorders of Digestion* and *Respiratory Diseases* may be had, by physicians, upon application to

**LAMBERT PHARMACAL COMPANY**

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St. Louis, Mo.

















